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USSR Report

MILITARY AFFAIRS

AVIATION AND COSMONAUTICS

No. 2, February 1985

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Except where indicated otherwise in the table of contents the following is a complete translation of the Russian-language monthly journal AVIATSIYA I KOSMONAVTIKA published in Moscow.

CONTENTS

[III - USSR - 4]

67TH ANNIVERSARY OF THE SOVIET ARMED FORCES

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 1-3

[Article by Hero of Socialist Labor Col Gen Avn N. Shishkov: "Created By Lenin, Nurtured By the Party"]

[Text] On 23 February our people and the fighting men of our Army and Navy are celebrating with great fanfare and ceremony the 67th anniversary of the Soviet Armed Forces. The celebration is particularly significant this year. Active preparations are in progress in our country for celebrating the 40th anniversary of the Victory of the Soviet People in the Great Patriotic War and for the 27th CPSU Congress. In addition, this year is the final year of the 11th Five-Year Plan. "Unquestionably all this will give special political significance to that great work which awaits us in the new year," stressed CPSU Central Committee General Secretary Comrade K. U. Chernenko, chairman of the Presidium of the USSR Supreme Soviet, in his address at a CPSU Central Committee Politburo meeting on 15 November 1984. "It should be marked by mobilization of all resources for successful completion of the current five-year plan and creation of a good, solid foundation for the 12th Five-Year Plan."

The plan targets pertaining to development of the national economy of the USSR in the final year of the current five-year plan are directed toward further consolidation and development of positive trends in our economy. The plan specifies a higher growth rate for the economy in general economic indices than the average for the preceding years of the five-year plan. Emphasis is placed on intensification of societal production. Considerable importance is attached to the branches of the fuel and energy complex. As in the past, the gas industry and nuclear power engineering will grow at a rapid pace. Metallurgical workers and machine builders will also be tackling ambitious tasks. There will occur intensification of the process of providing agriculture and all branches of the agroindustrial complex with a full abundance of modern equipment, and agriculture will be supplied with increased quantities of mineral fertilizers. As was noted at the October (1984) CPSU Central Committee Plenum, the work being done is favorably reflected in a steady rise in the standard of living of Soviet citizens. And this, as we know, is the main criterion of the effectiveness of our party's economic policy and faithfulness to the formulated strategic policy line.

Our fighting men -- reliable defenders of the historic achievements of the Great October Revolution, worthy continuers of the glorious revolutionary, labor and fighting traditions of the CPSU, the Soviet people, and their heroic Armed Forces -- are imbued with common thoughts with the Soviet people and our country's Communist Party.

In our country the people and army are indivisible. The great ideas of the Communist Party, its policy and tireless activities, directed toward increasing the might of the socialist homeland, cement this unity. The wise and foresighted leadership of the Leninist Party is an inexhaustible source of the strength and might of the Soviet Armed Forces. This was vividly manifested during the years of civil war and foreign military intervention, when the young Red Army, with the active support of the workers and peasants, succeeded in defending the achievements of the revolution and in crushing its numerous foes. In savage battles, crushing the White Guardists and interventionists, the Red Army achieved a victory of world-historic significance. The young Republic of Soviets emerged victorious in battle with the reactionary forces of the capitalist world.

Accomplishing difficult tasks pertaining to building socialism and unswervingly implementing a policy of peace and cooperation with all countries, the Communist Party and the Soviet Government were constantly guided by V. I. Lenin's statement that "the first commandment of our policy, the first lesson... which all workers and peasants should learn, is to be alert, to remember that we are surrounded by people, classes, and governments which openly express the greatest hatred toward us."

The profound socioeconomic transformations carried out during the years of the first five-year plans made our country one of the world's greatest industrial powers. Intensive work aimed at technical reequipping and establishment of an army, air force, and navy meeting the demands of the time was in full swing during this period. Training of military cadres was proceeding on a large scale. Soviet fighting men graphically demonstrated the increased combat capabilities of our hardware during the fighting in Spain and China and during the rout of the Japanese invaders at Lake Khasan and on the Khalkhin Gol River.

Engendered by the Great October Revolution, the Soviet Armed Forces worthily carried their combat banners through the savage battles of the Great Patriotic War. With their selfless service to the socialist homeland and the shining ideals of communism, they earned the fervent affection and gratitude of the peoples of our country and the toilers of the entire world. During a difficult hour of danger hanging over our homeland, all Soviet citizens responded as one to the call of the Communist Party and rose to the defense of the homeland. The country was transformed into a unified military camp. The party slogan "Everything for the front, everything for victory!" defined the activities of each and every Soviet citizen. The army and navy received everything they needed in order to deal a devastating blow to the aggressor.

The severest war in the history of mankind raged for 1,418 days and nights. It revealed to the world the might of the valiant Soviet Armed Forces and

demonstrated the indissoluble unity of army and people. Valiantly battling the hated foe on the ground, in the sky, and on the sea, Soviet fighting men displayed mass heroism and total dedication to the socialist homeland and the great cause of the Communist Party.

The grandiose battles of Moscow, Stalingrad, and on the Kursk Salient are golden pages in the glorious history of our Armed Forces. The Iasi-Kishinev, Belorussian, Lvov-Sandomierz, Baltic, East Prussian, Vistula-Oder, Berlin, and Manchurian operations constituted a model of Soviet art of warfare.

The further the harsh years of struggle against the fascist invaders and their satellites recede into the past, the more vividly are revealed the great significance of the military feats and moral purity of the Soviet fighting man -- defender of his homeland and liberator of the peoples of Europe from the brown plague of fascism.

The Soviet people, preparing to celebrate the 40th anniversary of the great victory, pay the tribute of deep love and respect for those who during the terrible years of the Great Patriotic War accomplished unprecedented feats, those who by their deeds, courage and steadfastness displayed examples of selfless service to the socialist homeland.

During those flaming years our people and their Armed Forces bore the brunt of the struggle against the fascist aggressors. At the cost of vast sacrifice of life and physical deprivations, they defended the achievements of socialism, the most progressive societal and governmental system, their freedom and independence, graphically demonstrating the superiority of socialism over capitalism and the triumph of the ideology of Marxism-Leninism, the ideals of Soviet patriotism and proletarian internationalism, and the indestructible friendship among the peoples of the USSR. And attempts by today's enemies of the Soviet land to spread lies about our Armed Forces, to falsify to mankind their role and accomplishments in crushing fascist Germany and militarist Japan are also doomed to failure. Nothing can diminish the immortal war feat of the Soviet military victor and liberator.

The victory over fascism constituted a historic milestone in the destiny of all mankind. Its most significant results are today's successes of world socialism and the steady growth of the revolutionary forces of the contemporary era.

During the harsh times of those terrible war years the front was situated not only on the fields of battle, where bombs and shells were bursting. Heroically fighting the fascist aggressors, the army was constantly cognizant of the support of the entire people. Our Great Victory was forged out not only in battle but in labor as well. For example, from July 1941 through August 1945 the Soviet Union produced 102,800 tanks and self-propelled guns and 834,000 guns and mortars. It is also universally acknowledged that many of our most mass-produced combat equipment items were superior to the finest foreign counterparts in their performance characteristics.

Our aircraft industry also made a substantial contribution toward the Great Victory over Nazi Germany, working alongside the other branches of socialist

industry. As a result of the considerable organizational and mass-political work by the party Central Committee and Soviet Government, by mid-1943 our Air Forces possessed twice as many aircraft as the fascists. Average monthly aircraft production rose from 2,100 in 1942 to 2,900 in 1943. In 1943 the Soviet aircraft industry furnished the military with approximately 35,000 aircraft and 49,000 aircraft engines.

Our aircraft plants built approximately 137,000 aircraft from the beginning of the war through September 1945. Twenty-five aircraft of new types, including modified versions, and 23 engines were put into regular production. Soviet fighters and bombers designed at the prototype design offices of S. Lavochkin, A. Mikoyan, A. Yakovlev, S. Il'yushin, V. Petlyakov, and A. Tupolev were distinguished by excellent flying and combat performance characteristics, while the famed Il-2 ground-attack aircraft was acknowledged the world's finest aircraft in action over the battlefield. The inspired labor of aircraft engine designers A. Mikulin, V. Klimov, A. Shvetsov, and others also deserves high praise.

Within the first few months of the Great Patriotic War work began, on the initiative of V. Bolkhovitinov, on designing a fighter-interceptor powered by a liquid-fuel jet engine. In the process of designing this unconventional aircraft, design engineers came upon a number of bold and progressive solutions. On 15 May 1942 test pilot G. Bakhchivandzhi made a historic flight on the Bi-1. This was our country's first flight by a jet aircraft, which added a new and brilliant page to the chronicle of Soviet aviation and which opened up a new stage in the development of aircraft.

The CPSU and Soviet Government had high regard for the labor of the aircraft builders. The workforces of many plants and design offices as well as tens of thousands of workers, engineers, technicians, and production supervisors were awarded medals and decorations. Many plant general managers and chief designers were awarded the title Hero of Socialist Labor. Vanguard workforces were awarded permanent custody of State Defense Committee banners.

Those who made an enormous contribution to development of the socialist economy, to the emergence and growth of our aircraft industry, those who successfully passed the stern test and became a prominent expert in aviation included V. Balandin, A. Tret'yakov, V. Litvinov, M. Zhezlov, M. Lukin, S. Agadzhanov, V. Okulov, L. Sokolov, A. Belyanskiy, A. Kuindzhi, L. Leshchenko, M. Korneyev, P. Voronin, V. Boytsov, A. Belov, M. Gotseridze, P. Lavrent'yev, and others.

Unparalleled labor heroism was displayed by test pilots and aircraft builders. This was difficult and important labor by aviation people who would remain at their work stations 12 hours or more a day. All their actions and thoughts were focused on a single great goal -- achievement of victory over the hated foe. One cannot help but delight in their remarkable deeds; our people continue today to take pride in their exploits and flaming patriotism.

The postwar years were also difficult for our country. By means of enormous efforts and intensive shock-work labor, the Soviet people healed the wounds inflicted by the war. They rebuilt cities and villages, plants and factories,

building new industrial and agricultural enterprises. During that period of nationwide building enthusiasm, however, the Communist Party was compelled to devote considerable attention to strengthening the defense capability of the state, the might of the Armed Forces, to increasing their combat readiness.

The situation which was developing in the international arena made it necessary to do this. Hardly had the guns of war fallen silent when ruling circles in the United States, Great Britain, and other capitalist countries again placed mankind before the threat of war -- a third world war. Imperialism proceeded to engage in an intensified arms race. Putting together the aggressive NATO, CENTO, SEATO and other blocs, the United States built military bases on foreign soil and proceeded to engage in nuclear blackmail. A "cold war" commenced.

The wisdom and foresight of the Communist Party in guiding and directing the Armed Forces, its organizing and guiding influence on all military life and activities were manifested with renewed force during this critical and difficult period. It was precisely due to daily concern by the CPSU that the Soviet Armed Forces received sophisticated models of combat equipment and weapons. In response to the aggressive aspirations of imperialism, nuclear weapons and means of delivering them to the target were designed and built in short order through the efforts of Soviet scientists, which ended the nuclear monopoly of the aggressive imperialist forces. Serious changes also took place in development of the Soviet Air Forces. We transitioned to missile-armed supersonic jet aircraft. The increased production capability of the Soviet aircraft industry promoted the development of the most modern combat aircraft models. Military transport aviation was furnished with new aircraft. Helicopters became a firm component of today's combined-arms engagement.

The combat potential of the Armed Forces today is a solid fusion of a high degree of technical equipment, military expertise, and indomitable morale. The Army and Navy consist of outstanding personnel. Soviet military aviators are highly-trained professionals who are ideologically fit and totally dedicated to the CPSU and to their socialist homeland. They are working persistently to master modern equipment and are learning that which is essential in war.

True to Lenin's behests, the Communist Party is doing everything to ensure that our Air Forces possess everything they need to perform their important mission and guard the productive labor of the Soviet people together with the other branches of the Armed Forces. This is also very important because imperialist reaction is attempting to tilt the established military balance and is undertaking one action after another in order to heat up even more an already difficult international situation and to plunge the world into the abyss of nuclear missile war. This dangerous, adventuristic imperial policy on the part of the present U.S. Administration has now entered a new phase.

Through the fault of imperialist circles, particularly the United States, which has unleashed an unchecked arms race, world nuclear arms stockpiles have been amassed to a degree which is truly absurd from a military point of view. U.S. strategic nuclear forces alone can deliver approximately 12,000 nuclear warheads in a first strike. Their aggregate yield exceeds the total

megatonnage of all explosives and munitions employed by the nations of the world in the 6 years of World War II. And if one considers the approximate equality in nuclear arms between the opposing sides, one need not be a military expert to understand that further amassing of such arms is becoming simply senseless and highly dangerous. But excessive nuclear arms stockpiles not only do not guarantee security and impunity to any aggressor but, on the contrary, increase the probability that an aggressor will be the target of crushing retaliation. Calculations by the strategists across the ocean of the possibility of fighting a "limited" nuclear war are totally without foundation. Any limited employment of nuclear weapons will inevitably lead to immediate utilization of the entire nuclear potential of the opposing sides. This is the stern logic of war.

All this confirms with renewed emphasis Lenin's conclusion that the danger of war "will not cease as long as world imperialism continues to exist." This warning has remained valid to the present day. But the qualitatively new sociopolitical and military-technical premises and circumstances which have developed in the world of today objectively create conditions for eliminating wars as a sociopolitical phenomenon, and particularly worldwide military conflicts, which contain the threat of annihilation of world civilization as a whole.

The stern lessons of the world war are of continuing significance in the present day as well. As is emphasized in the CPSU Central Committee decree entitled "On the 40th Anniversary of the Victory of the Soviet People in the Great Patriotic War, 1941-1945," the main lesson is that one must struggle against war before it starts. Forces and capabilities are available for this. Today aggressive imperialist circles must reckon with the growing weight and influence of these forces, with the might of the Joint Armed Forces of the Warsaw Pact member nations. In connection with this, Comrade K. U. Chernenko stresses that as long as military and political tension continues to exist, as long as our country is threatened by a nuclear-missile danger on the part of the United States and the NATO nations, we must keep our powder dry and be alert at all times to ensure that the balance of power does not shift in favor of imperialism, with us ending up in a weaker position.

These statements by the Soviet leader are in conformity with the noble aspirations of the people of our country and of all peace-seeking mankind. They constitute a program of action for the fighting men of the USSR Armed Forces, a sacred obligation of which is reliably to defend the achievements of socialism and world peace together with their Warsaw Pact fighting friends.

Military aviation personnel are greeting the 67th anniversary of the Soviet Army and Navy by further increasing the combat readiness of units and subunits. In the current training year, at the initiative of the Red Banner guards bomber regiment under the command of Gds Col A. Tsar'kov, socialist competition is in progress in the Air Forces to honor in a worthy manner the 40th anniversary of the Victory of the Soviet people in the Great Patriotic War and the 27th CPSU Congress.

The winter training period is in full swing. Air Forces personnel are working with enormous political enthusiasm. Pilots, navigators, engineers,

technicians, junior aviation specialists, and military personnel of the aviation rear services and other subunits, profoundly aware of the complexity of the international situation and their constitutional duty, are filled with resolve to achieve new accomplishments in combat improvement, in successfully mastering modern aircraft systems, and in strengthening discipline, organization, and orderly routine in Air Forces units and subunits.

3024
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AIR TRAFFIC CONTROLLER SIMULATOR CLASSROOM

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 4-5

[Article, published under the heading "Engendered by Innovative Thinking," by Maj Gen Avn V. Gorbatykh: "Flight Operations Officer Simulator"]

[Text] Before receiving authorization to perform the duties of flight operations officer, a commander (as a rule an experienced, highly proficient pilot) studies theoretical materials and control tower equipment in a special training program and takes part in air traffic control as a member of an ATC team.

After this, following training conferences or special exercises, courses of training and passing tests, he serves for a period under an experienced specialist, closely watches the latter's actions and endeavors to learn the finer points of air traffic control. Only after this is he certified to serve as a flight operations officer.

Considerable time is required for this mode of training. Sometimes it takes years for an officer to become a highly-skilled specialist, to hone and perfect his actions in a practical manner in response to unusual and emergency situations in the air. No other way existed. Indeed, one cannot create an emergency situation in the air.

A serious discussion was conducted at a meeting of the district air forces Military Council on the problems of training highly-skilled air traffic control specialists.

This meeting was preceded by considerable preparatory work. In particular, the methods of training air traffic control team specialists was examined, in the course of which certain deficiencies were revealed. It was established, for example, that one of the reasons for deficiencies is the absence of a uniform method of performing job-related duties by the ATC team and training of tower-controller duty shift members. The adopted resolution prescribed implementation of a number of specific measures within a short period of time, measures aimed at solving the problem of training air traffic control specialists. A decision was made to design and build an efficient simulator to improve job-related knowledge and develop air traffic control skills.

It was necessary to start from the ground up, as they say, since the unit had no experience in designing or building such simulators. A team of efficiency innovators headed by Maj V. Kulikov was assigned the job of concept execution.

We should note that fitting out a simulator classroom was the concluding stage of equipping a training facility which meets the highest demands placed on organization of the learning process. In addition to a simulator training room, three classrooms containing technical learning devices were set up in a beautifully-appointed training building. In addition, efficiency innovators set up a number of electrically-wired display stands which help in mastering complex operational-tactical training items.

Building of the simulator classroom proved to be so important that regular training sessions for duty-shift ATC teams began long before simulator equipment was completed; at these training sessions personnel not only worked on air traffic control skills but also worked on improving simulator training methods. As a rule training sessions abounded in emergency situations which demanded that the correct decision be made without delay. Officers N. Bolotov and G. Manakin as well as reserve officer A. Kurdyumov took active part in organizing and conducting these classes. They also did a good deal of work on devising and perfecting teaching methods.

What tasks can be accomplished with the simulator classroom? With its assistance one can test the knowledge of job-related duties of air traffic control team members, improve the skills of ATC specialists, work on ATC personnel responses where emergencies and other nonroutine situations arise, and conduct combined training drills with command post duty shifts and air traffic control teams. In addition, the classroom equipment makes it possible to conduct training drills for tactical control officers involving working in coordination with fighters.

Tower controller team member work stations are positioned and equipped taking into account the requirements of engineering psychology. They include two TV screens depicting the air traffic environment and topography with air routes. The weather situation is depicted on a separate display. In addition, there is an automatic radio direction finder remote display. All work stations are provided with direct telephone and public-address communication with higher-echelon and coordinating control facilities, the role of which is performed by a scenario executing team. A separate public-address communications system is used to simulate radio communications with aircraft.

In an adjoining room a section of terrain has been reproduced with a high degree of accuracy on a scale of 1:200,000. Superimposed on the terrain model are air routes, zone boundaries, control handover points and other essential ATC center elements. Special devices project target returns onto the air routes or directly onto the model.

Position data on artificially generated targets are taken with a TV camera and then superimposed onto the air environment, which has been recorded in advance on videotape. The synthesized air environment is reproduced on the TV

displays. It essentially differs in no way from an actual air environment. This is one of the main advantages of the simulator.

When necessary the "terrain" can be illuminated for greater clarity of representation. In particular, with side lighting a highly-realistic terrain image is reproduced on the display.

The scenario execution team work stations are set up in a separate room: target tracking radar operator, team officer in charge, duty shift officer in charge, and command post officer. They are equipped with the essential communications, remote command and control devices, and simulation devices. An actual air environment recorded on videotape is reproduced on the displays as the initial situation. All communications are recorded on multitrack tape with time marking.

In designing and building the simulator classroom, the efficiency innovators solved a number of technical problems which expand the capabilities of the equipment. For example, during playback of a videotape depicting an actual air environment, a video camera can operate simultaneously, depicting the position of artificially generated target returns. A special device mixes the signals before feeding them to the display. As a result the scenario situation is superimposed on the terrain. Also unique is a semiautomatic device which ensures that the artificially generated targets move at the desired speed and in the desired direction.

In the future it will be possible to feed to the displays an actual air environment directly from a working radar, which will enable trainees to handle problems with elements of chance. In view of the presently limited capabilities as regards number of simulated targets, plans call for installation of a multiple-program air environment situation device, which of course will simplify the job of the scenario execution team.

Training activities in the simulator classroom are conducted in conformity with a specially devised method, which is being constantly improved. The main thing is proper sequence of learning.

The first stage includes the entire aggregate of measures pertaining to preparing an ATC team for a flight operations shift. From one and a half to two hours before commencement of simulated flight operations (depending on the natue of the flight operations problems) the instructor hands the men the task assignment, a copy of the flight operations schedule, briefs them on the current and forecast weather, operating restrictions, the air and ground environment, as well as specific features of communications and radar support services.

After the shift officer in charge reports ready for the simulation drill, the instructor checks the validity of the formulated solutions and proceeds with the second, principal stage. The training drill is conducted according to a plan, but improvisation is also possible, that is, change in the sequence and character of the problems by decision of the instructor. In the course of the simulation drill the instructor closely monitors the men and, if necessary, intervenes. This enables him thoroughly to study the men's level of

preparation but also their job-performance and moral-psychological qualities. Observations indicate that at a certain stage some trainees become so absorbed in the situation that it seems real.

Practical experience in conducting training drills over the course of a year's time has made it possible to determine deficiencies in the training preparation of air traffic control personnel. Purposeful training sessions have resulted in correcting errors. Regular simulator sessions have improved the quality of training of flight operations officers. In our opinion this is the most important psychological aspect of training activities. Quality of air traffic control and flight safety have improved significantly. We can cite, for example, a proficient job being done by the ATC team headed by Lt Col L. Babich. It assisted an aircrew in making a landing in difficult conditions. ATC teams led by Lt Col R. Oberyukhtin and G. Boltenkov worked smoothly in handling an in-air emergency.

Of course unresolved problems remain. There are still many debated questions pertaining to method of conducting training drills and effectiveness of utilization of the simulator classroom. One thing is clear, however: such a simulator is needed for training air traffic control teams and tactical control officers. This is a good learning device in holding methods and demonstration classes and combined training drills.

3024
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PROBLEMS OF MASTERING NEW AIRCRAFT REVIEWED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 6-7

[Article, published under the heading "Be Alert, In a Continuous State of Combat Readiness," by Military Pilot Expert Marksman Col S. Oskanov, Candidate of Medical Sciences Lt Col Med Serv I. Alpatov, and Candidate of Medical Sciences V. Stupnitskiy: "Mastering New Equipment"]

[Text] Thanks to constant concern on the part of the Communist Party and Soviet Government, Air Forces subunits are periodically reequipped with new aircraft. Therefore flying personnel naturally sometimes have occasion to master combat aircraft of several types in the course of their service career.

We must state that every modern fixed-wing or rotary-wing aircraft is designed to the scientific and technological state of the art and incorporates the latest advances. It possesses enormous flying-tactical performance, aiming-navigation and weapons capabilities, which the aircrew must learn to utilize in full measure in order to defeat the adversary in any complex tactical and weather environment. And this in turn places very high demands on the individual who operates a modern aircraft system.

As we know, man's physiological and psychological capabilities are not unlimited, and sometimes they become an obstacle in the path of successful mastery of new equipment. This is why the importance of all types of aviator psychological and functional readiness to fly is increasing considerably today, and why heightened demands are being imposed on his emotional stability, his mental and energy capabilities, on maintaining an optimal mental and emotional state, and on one's ability to make critical decisions. It is precisely these qualities and types of pilot preparedness which should continuously be formed, shaped and maintained by the entire system of learning to master a new aircraft.

The process of transitioning to new aircraft systems is complex and multifaceted. Let us examine some of its aspects.

The maneuver capabilities of new aircraft have increased substantially as a result of an increased thrust-to-weight ratio and improved aerodynamic characteristics. In connection with this, one of the "oldest" factors of

flying activity -- G loads -- is today assuming qualitatively new significance. While on aircraft of earlier generations pilots experienced G forces of comparatively short duration, today the situation has changed considerably -- G loads can be of considerable duration, shifting from positive to negative, increasing at different gradients, and submaximal in magnitude. This also determines higher demands on the pilot's capability to tolerate G forces and requires a more thorough and well thought-out effort against such a complex and dangerous factor of flying activity.

An individual's capability to withstand elevated G forces can be increased with the aid of a system of purposeful measures: stepped-up dissemination of medical knowledge on the effects of G forces on the human organism and the physiological mechanism of adaptation to them, the forming of correct behavior in the process of adaptation, early diagnosis of various forms of autonomic-vascular instability, prevention of overheating on the ground and in the air, adequate rest and prevention of violations of preflight regimen, as well as precise observance of the rules of operation of corresponding auxiliary devices, and careful fitting of pressure suits. Specialized physical training drills aimed at increasing tolerance to G forces are important elements.

A method of physical training has been devised on the basis of research results, a method which includes training specific muscle groups (pectoral, abdominal and quadriceps) for protracted stress in conditions of impaired external respiration, that is, with an insufficiency of oxygen. Muscles which are little work-loaded in normal conditions, such as the hamstrings, are also exercise-strengthened.

It is without question very important efficiently to utilize so-called waiting time, which aircrews have available, for example, when on alert duty and between training sorties during flight operations shifts. During these hours it is advisable to engage in relaxing specialized gymnastics or to perform physical exercises which do not require considerable effort but are tailored to the specific features of the forthcoming flight. Of course an organizing role here should be played by flight surgeons and physical training supervisors. Such training activities are tailored to the pilot's individual characteristics. Of course specialized physical exercises can also be performed during a free moment, when off duty, and during morning calisthenics. Bearing in mind the role of the factor of G forces on some new-generation aircraft, it is advisable to assign flying personnel to retrain to new aircraft taking their state of health and age into account, in order more fully to utilize the combat capabilities of these new aircraft.

Another, no less important factor in making flying new types of aircraft more complicated is low-altitude maneuvering. The fact of a limited altitude cushion is a powerful emotional-informational stress stimulus, which causes tension in a pilot and can disrupt the delicate coordination of control motions, the customary rhythms and sequence of performance of cockpit operations. In addition, many accustomed orienting features change: the size of ground reference points, their mutual positioning, illumination, intensity of coloration, and the like. This requires definite adjustment of flight training method and a deeper understanding by flying personnel of the dynamics of low-level flight and consideration of the aerodynamic peculiarities of the

aircraft and its control systems, as well as purposeful moral-psychological preparation. Assessment of a pilot's preparedness for a specific flight assignment should be more objective.

Improvement of aircraft equipment, navigation and flight instrument systems is also accompanied by a gradual reduction of aircraft weather minimums. This factor was always presented in the form of an acute flight safety problem. When making a landing approach with a low ceiling and poor visibility, pilot visual contact with the runway is established at an unaccustomedly low altitude in direct proximity to the ground. This has a strong emotional effect on the pilot. It is therefore of paramount importance to instill in aircrews confidence in the automatic landing systems and to develop the ability quickly to note problems in operation of automatic systems and promptly to take over manually. Considerable reserve potential is to be found precisely in the pilot's method of transition from instrument to visual flying. When flying the cockpit simulator and an actual aircraft, it is essential to practice missed approach procedures after the IFR hood is raised unusually close to the ground.

During the period of mastering new equipment, many circumstances which commonly occur in one's daily experience may assume an additional adverse significance. For example, a temporary period away from flying due to illness has little psychological or emotional effect on the pilot under normal conditions. But during transition to a new aircraft this as a rule involves considerable negative consequences. A pilot falls behind his comrades, which inevitably results in additional stress. This particularly commonly occurs in persons with inadequate psychoemotional stability or in persons with a particular desire to master the new equipment. In these cases various complications (minor equipment malfunctions in flight, interpersonal friction on and off the job) have a more serious effect. Commanders and flight surgeons should take note of such nuances of stress-causing situation and take preventive measures in a prompt and timely manner.

New aircraft always have their peculiarities: a different cockpit, a different canopy shape, absence of canopy framing members, and different placement of instruments and selector switches. In combination with other design changes, such as an unaccustomed angle of nose slope, this can deprive a pilot of his accustomed references and alter his sighting angle on final approach glidepath. It turns out, for example, that good visibility from the cockpit during extremely low-level flight alters apparent distance to ground reference points and impels the pilot to initiate climb prematurely. All these features cause additional difficulties in a psychological respect. In order to overcome them it is necessary specially to train aircrews to perceive in an aware, calm manner the altered conditions of flying aircraft of new types and to teach them to make the necessary corrections and adjustments in assessing in-flight situations in a prompt and timely manner. This helps eliminate psychological stresses and emotional tension, especially on first solo flights.

An aggregate of factors -- substantial and protracted G forces, a significant element of the new, and complexity of flight assignments -- can increase pilot stress and promote fatigue. This factor should be considered in determining

normal flying work load and requires of medical personnel in turn dynamic medical oversight during the entire period of transition training on the new equipment.

Flying personnel are greatly helped in mastering new equipment by conversations with pilots who have already mastered the given aircraft, as well as a log in which all a unit's pilots record their impressions after making their first solo flights on the new aircraft.

The experience of vanguard subunits indicates that mastery of new-type aircraft is proceeding successfully, with well-motivated flying personnel. Pilots perform flawlessly and intelligently when problems arise. Squadron commander Lt Col A. Tolubayev and Senior Pilot Capt V. Gel'mich, for example, were able successfully to complete a flight in a difficult air situation, which made it possible to determine the precise cause of the in-flight emergency and to take prompt preventive measures. The pilots, responding with composure, marshaling their professional capabilities in an emergency and utilizing the reserve capabilities of the new equipment, were commended by the command authorities.

The modern aircraft is not only a potent military machine but also a highly complex technical system. Its operation is accompanied by considerable physical exertion and a good deal of emotional stress, due to the need to monitor the readings of a large number of instruments, to process various information, and to maintain constant alertness, the importance of which increases as flight director instrumentation, automatic devices and automated control systems are adopted. The pilot should be able to recognize a dangerous situation quickly, to determine the cause, and to take immediate action.

"Knowledgeably, quickly, flawlessly," -- this pilot's rule of conduct is mandatory when mastering new equipment. The ability to maintain emotional stability, composure, clarity of thinking, precision of actions, the ability to make the only correct decision and to carry out the assigned mission in the most complex situation -- all these qualities assume paramount importance. The process of mastering a new aircraft proceeds successfully precisely on this foundation, fewer mistakes are made on first flights, and aircrews acquire the essential skills and ability, with strengthened faith in the reliability of the new equipment.

3024
CSO: 9144/316

FRUNZE'S CONTRIBUTION TO AVIATION NOTED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 8-9

[Article, published under the heading "M. V. Frunze Birth Centennial," by Candidate of Historical Sciences Col T. Uzhegov and Maj V. Dolgishev: "Revolutionary, Military Leader, Scholar"]

[Text] An outstanding pleiad of professional revolutionaries and military leaders of a new type, advancing from the depths of the masses, was forged out in our country in the flames of three revolutions and a civil war. One of its brilliant representatives was prominent Communist Party and Soviet Government figure and Civil War hero M. V. Frunze.

Mikhail Vasil'yevich Frunze lived only 40 years. But more than 20 of these were years of continuous and inspired struggle for implementation of the ideas of Marxism-Leninism. He joined the RSDWP [Russian Social Democratic Workers' Party] as a youth of 19 and remained a faithful party warrior to the last days of his life. A man of analytical mind and with versatile talent, he was first and foremost a proletarian revolutionary. His harsh, difficult career of professional member of the underground included participation in revolutionary battles, arrests, penal servitude, and internal exile. He was twice sentenced to death by a czarist court. But neither arrest, nor death sentences, nor hard labor broke the spirit of this Leninist revolutionary. On the contrary, they made him even tougher.

A faithful disciple of Vladimir Il'ich Lenin, M. V. Frunze worked persistently to carry out his demands that Bolsheviks seriously study military affairs. He made a profound study of military literature, disseminated military knowledge among his fellow internal deportees, organized a special study group for this purpose, and subsequently conducted revolutionary work in the czarist army.

His talent as a political organizer and military leader was particularly brilliantly displayed during the years of the Civil War. The party sent its finest representatives into the revolutionary army. Frunze directed combat operations on the Eastern Front, and subsequently on the Turkestan and Southern fronts. In his field command activities Mikhail Vasil'yevich employed aggressive forms of conduct of combat operations. In the defense he skillfully maneuvered his troops, counterpunching wherever the enemy least

expected it. In the offense he skillfully concentrated his forces in a narrow breakthrough sector and achieved victory even when lacking an overall superiority over the adversary. He was exceptionally persistent, firm, and consistent in executing his plans, which were distinguished by originality.

After the Civil War came to an end, Frunze did a great deal of fruitful work in the positions of commander of the Ukraine and the Crimea, military academy (which today bears his name) commanding officer, people's commissar of military and naval affairs, and chairman of the Republic Revolutionary Military Council. He directed preparations for and implementation of the military reform of 1924-1925.

While holding important positions, M. V. Frunze showed himself to be an outstanding military theorist. Utilizing his profound knowledge of Marxist-Leninist theory and the experience he acquired during the Civil War and in the postwar years, he made a large contribution toward formulating all the component parts of Soviet military science, especially theory of art of warfare. He pioneered synthesis of the Lenin military-theoretical legacy and was one of the first military theorists to commence elaboration of problems pertaining to the leadership role of the Communist Party in Soviet military organizational development and the mechanisms of growth of its role in the life and activities of the socialist army. In his writings "Reorganization of the Red Army," "A Uniform Military Doctrine and the Red Army," "Military-Political Indoctrination of the Red Army," "Battlefront and Home Front in the War of the Future," "Lenin and the Red Army," which were permeated with the spirit of party-mindedness, as well as in other writings, synthesizing the lessons of World War I and the Civil War as well as the evolution of military hardware, M. V. Frunze formulated on the basis of Marxist-Leninist methodology the fundamental principles of military organizational development, strengthening of the defense capability of the world's first socialist state, and matters pertaining to development of Soviet military strategy, operational art, tactics, theory of training and indoctrinating personnel, and organization of party-political work in the army and navy. His writings were of great methodological significance and helped accomplish the tasks of strengthening the defense of the Soviet State in a practical manner.

Defending the party line in military affairs, M. V. Frunze criticized the Trotskyites, who denounced military science and claimed that war was a "craft," a practical art. He deemed it essential to develop Soviet military science and to continue strengthening the Workers' and Peasants' Red Army on the basis of this science.

"One of the basic conditions for ensuring maximum power of the Red Army," he stated in his "Reorganization of the Red Army," "is its transformation into a unified organism, solidly knit from top to bottom not only by a common political ideology but also by a unity of views on the nature of military tasks facing the Republic, modes of accomplishing them and methods of troop combat training."

V. I. Lenin highly praised Frunze's role as an eminent proletarian field commander and military theorist. His own personal library, among books on military affairs, included M. V. Frunze's solid study entitled "Yedinaya

voyennaya doktrina i Krasnaya Armiya" [A Uniform Military Doctrine and the Red Army]. In this work, written taking the leader's instructions into account, the author, having defined the objective conditions which evoke the necessity of formulating a scientific theory of war -- a uniform military doctrine -- for the first time gave it a scientific Marxian definition and revealed its class content and socioeconomic conditionality. The theses contained in this work are essentially applicable today as well.

M. V. Frunze expressed his views on the nature of contemporary war in a number of writings and speeches. "In a clash between first-rate adversaries," he wrote, "the outcome cannot be decided by a single blow. A war will assume the character of a protracted, savagely-fought contest, putting to the test all the economic and political underpinnings of the belligerents." Absolutely convinced that the aggressive imperialist countries would attempt to test with the point of a bayonet the foundations of Soviet rule and the young socialist state, M. V. Frunze put forth an appeal for a persistent effort to prepare the Red Army and the nation to defend revolutionary achievements.

These theoretical points were persuasively confirmed during the years of the Great Patriotic War.

Mikhail Vasil'yevich elaborated with considerable completeness the problems of the home front and battlefront in war. Proceeding from the position that air power carries military operations deep into the heartland, he reached the following logical conclusion: "Henceforth not only that portion of the people which is under arms will be fighting. The entire people as a whole will be drawn into the military struggle in one form or other, directly or indirectly...." He maintained that all government agencies and the entire masses as a whole should be enlisted to the cause of national defense in peacetime and in time of war. As regards the character of military operations, Frunze was a consistent advocate of mobile warfare. He grounded his views not only on the lessons of the Civil War and other wars but also the increasing sophistication of hardware. The war of the future, he emphasized, "will be to a considerable degree, if not entirely, a war of machines."

M. V. Frunze insightfully foresaw the exceptionally important role of a new branch of the Armed Forces -- the Air Force. "We can acknowledge with complete confidence," he stated at an official meeting dedicated to the second anniversary of the Society of Friends of the Air Force (ODVF), "that any country which does not possess a strong, well-organized, well trained and prepared air force will inevitably be doomed to defeat."

With all the energy of a Bolshevik-Leninist, he stated the question before the party and people on the necessity of eliminating as quickly as possible the Soviet nation's dependence on the foreign market for aircraft and engines. Frunze saw as the key to accomplishing this task extensive development of the metallurgical industry and establishment on this foundation of a solid base for a genuine, well-organized Soviet machine building industry. And he urged that they proceed thereby not from the requirements stated by the Red Air Force at that moment but rather from the demands of wartime, when requirements in aircraft and engines would be enormous.

Development of Soviet aviation was inseparably linked with the name of Frunze, who closely followed its emergence. On his instructions units gathered for the May Day parade and aviation maneuvers were organized. He precisely defined the nature and role of army, strategic and naval aviation in overall Air Force organizational development, the role and significance of research work in the area of the Air Force and the aircraft industry. While attaching enormous importance to the role of technology in the war of the future, however, and taking all measures to ensure that the Red Army was armed with modern combat hardware, Mikhail Vasil'yevich did not blindly worship technology, resolutely and ruthlessly exposing bourgeois military ideologists, who boiled man's role down to a simple appendage of the machine.

Based on a dialectical-materialist assessment of the role of man and machine in contemporary war, he called for "giving a correct understanding of the actual role of the machine and its actual significance by work both in the military and in the civilian sector. We should state that ultimately a determining role is played not by a machine; behind a machine there is always a living human being, without whom the machine is lifeless."

Attaching enormous importance to the moral factor in war, M. V. Frunze pointed out that the Soviet socialist system and the domestic and foreign policy of the Communist Party and Soviet Government, which expresses the root interests of the toilers, constitute the source of the Red Army's high morale. At the same time he emphasized that excellent moral-fighting qualities do not arise spontaneously but are developed by the entire system of political and military indoctrination, by exceptionally painstaking and persistent work by commanders, political workers, political agencies, and party organizations.

The lessons of the Great Patriotic War fully confirmed the correctness of M. V. Frunze's views. Guided by Marxist-Leninist theory and the Leninist military-theory legacy, Soviet military science correctly resolved major theoretical and practical problems pertaining to the character of the forthcoming war, the role of the economic and moral factors in war, the role of the economic and moral factors in war, the modes and forms of its conduct. Aware of the complex international situation and the threat of attack on the USSR by aggressive imperialist forces, Soviet military strategists, defining the character of a future war, maintained that it would be protracted, that the armed struggle would be distinguished by a high degree of mobility and vast scale, and would require close coordination among all the branches of service and combat arms. A leading role was assigned to ground forces and military aviation. For example, just prior to the war the numerical strength of military aviation was increased, and military aviation was transitioning over to aircraft of new types, which in a number of indices were superior to the potential adversary's counterpart aircraft.

At the same time measures were taken to train aviation cadres. The Leninist Party and Komsomol instilled in the future pilots devotion to the people, love for the socialist homeland, willingness and readiness to defend it against any and all encroachments by aggressors.

History allotted too little time, however, for complete implementation of the specified measures to improve the combat might of the Air Forces. Only a

small number of aviation units (slightly more than 17 percent of the total number) succeeded in reequipping with new aircraft. But Soviet aviators, even flying aircraft of old types, boldly and courageously fought the aggressor, inflicting enormous losses. Our pilots displayed courage, valor and mass heroism. On the first day of the war alone more than 200 fascist aircraft were downed in aerial combat, while in less than a month's time the Hitlerites lost 1,284 aircraft.

Working together with ground troops, Soviet pilots dealt devastating blows against enemy personnel and equipment, and smashed the vaunted fascist military aviation in savage aerial clashes, making a worthy contribution to the cause of victory over the enemy.

Following glorious fighting traditions, the winged sons of the homeland boldly and resolutely engaged superior enemy forces, and when they ran out of ammunition, they would ram the enemy.

The Great Victory over fascism, won 40 years ago by the Soviet people and its Armed Forces, under the wise leadership of the Communist Party, convincingly demonstrated the undisputed advantages of socialism, the insuperable strength of our societal and governmental system, the ideas of communism, and the triumph of Soviet military science, toward the development of which Mikhail Vasil'yevich Frunze made a large contribution.

Today as well, when the reactionary forces of imperialism, particularly the United States, are pushing the world toward a nuclear missile war in hopes of appropriating for itself the role of arbiter of the destinies of peoples, the appeals with which M. V. Frunze ended his speech at an official gathering dedicated to the second anniversary of the Society of Friends of the Air Force ring with particular relevance: "Comrades, be alert!

"Comrades, work on strengthening the military power of the worker-peasant state!

"Comrades, build and strengthen Soviet red wings -- one of the principal means of ensuring the defense capability of our Union!"

Carrying out this behest of M. V. Frunze, military aviation personnel, solidly ranked behind our party and totally dedicated to their people, are vigilantly guarding the airspace of the socialist homeland and are prepared at all times to repulse aggressors and to carry out their patriotic and internationalist duty.

3024
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IMPORTANCE OF GAINING AIR SUPREMACY STRESSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 12-13

[Article, published under the heading "Experience Born in Combat," by Col Ye. Tomilin: "For Strategic Air Supremacy"]

[Text] The battle for strategic air supremacy was one of the most complex and important missions of the Soviet Air Forces in the Great Patriotic War, alongside providing cover and support to ground troops and air reconnaissance.

From the very first days of the war a battle in the air between Soviet and German air forces, unprecedented in history, erupted along a front extending from the Barents Sea to the Black Sea, a battle which ended in a brilliant victory by Soviet military aviation. In the initial period of the war, however, fascist air forces possessed air supremacy in the principal sectors. Immediately following the treacherous attack on the USSR, the enemy succeeded in destroying a substantial number of aircraft on the ground and in the air.

The Hitlerite command authorities, counting on taking care of Soviet air power with a surprise mass strike on airfields, assigned the principal role to attack aviation. At the commencement of the attack on the USSR, for example, bombers comprised 57.8 percent of the total number of aircraft of Germany's Luftwaffe, while fighters and reconnaissance aircraft comprised 31.2 and 11.0 percent respectively. And although in the initial period of the war the Luftwaffe possessed a combat aircraft fleet numbering in the many thousands, as well as flying personnel with combat experience, subsequently they were unable effectively to counter aggressive and resolute actions by Soviet fighters.

The struggle by Soviet aviation for strategic air supremacy in the Great Patriotic War encompassed two periods. The first (from 22 June 1941 through November 1942) is characterized by fierce air combat. In this period our Air Forces were transitioning over to new equipment, the organizational structure of aviation large strategic formations, combined units, and units was being improved, the Air Forces command and control system was being perfected, and the most effective forms of combat for air supremacy were being devised and tested.

The Soviet command authorities countered massive Hitlerite bomber raids with aggressive, offensive fighter actions in the air and periodic strikes on enemy airfields within the boundaries of each front. We were forced to take this measure. As air striking power increased, massive strikes were delivered in individual strategic sectors by the air forces of adjacent fronts, by long-range bomber combined units, the air forces of the fleets and National Air Defense Forces. In a number of instances these actions were in the form of air operations.

The struggle for air supremacy was waged in conditions which were exceptionally difficult for us. A large percentage of the aircraft plants in the European part of our country were evacuated eastward. And this had a telling effect on airplane production. Aviation units and combined units were equipped with aircraft for the most part of obsolete models. Therefore Headquarters, Supreme High Command [Hq SHC] concentrated in the Moscow sector an aviation force grouping totaling up to 1,200 aircraft. By the beginning of the counteroffensive the 2nd Air Force, which was supporting Army Group Center, totaled up to 700 aircraft. As a result of the measures taken, the initiative went over to the Soviet Air Forces. By the end of November they gained operational air supremacy for the first time in the Great Patriotic War and supported the shift by ground forces to a counteroffensive. In the Battle of Moscow the fascist Luftwaffe was dealt a devastating blow, which shattered the myth of its invincibility.

The struggle in the air was very intense in the winter and summer of 1942. Having lost a substantial percentage of their aircraft and their most proficient aircrews, the Hitlerite command authorities declined to conduct simultaneous aggressive air actions on all fronts and concentrated air efforts in the main sectors.

In the summer of 1942 the struggle for air supremacy shifted to the southern half of the Soviet-German front. By the commencement of the Battle of Stalingrad the fascist command authorities had concentrated here a large aviation force grouping, totaling 1,200 aircraft. This was more than double Soviet aircraft strength in this sector. The enemy air power also enjoyed qualitative superiority. Even in these difficult conditions, however, our aviators performed with determination and during the period of the defensive operation destroyed more than 1,400 enemy combat and transport aircraft in air engagements and on the ground.

In the first period of the war Germany and its allies lost more than 15,000 aircraft as a result of aggressive actions by the Soviet Air Forces, while German losses in all the other theaters in World War II totaled 3,400 aircraft.

The second period of the struggle for air supremacy ran from November 1942 through August 1943. During this time Soviet aviation units and combined units were transitioning over to qualitatively new aircraft, and the aircraft fleet was steadily growing. The Air Forces conducted several operations and fought several large battles in conformity with the Hq SHC plan. The outcome of the Soviet counteroffensive at Stalingrad depended directly on gaining air supremacy. The aviation force grouping was strengthened for this purpose,

with the total number of aircraft increased to 1,350. The enemy had more than 1,200 aircraft.

The new La-5, Yak-76, and Yak-9 fighters which had entered service provided capability to conduct effective air engagements with Me-109 and FW-190 aircraft. The correlation of forces which was established made it possible on the very first days of the counteroffensive to gain operational air supremacy, which was maintained until the end of the strategic offensive operation. During the Battle of Stalingrad Soviet aviators, together with National Air Defense forces and the troops of the front, destroyed more than 4,400 combat and transport aircraft in air engagements and on the ground. In the course of fierce fighting a start was made toward achieving a radical turning point in the struggle to gain strategic air supremacy on the Soviet-German front. Subsequently not in a single major operation did fascist air power succeed in seizing the initiative in the air for any extended period of time.

Air battles over the Kuban became a heroic page in the chronicle of the Great Patriotic War. By this time the Luftwaffe combat force level was at 1,400 aircraft. The fascists had a 50 percent numerical superiority. Fierce air engagements were fought in the skies over the Kuban. Soviet pilots boldly employed new tactics and effectively utilized their fighters' increased combat capabilities. The excellent moral-fighting qualities of our combat pilots as well as centralized command and control helped Soviet aviation achieve victory over the enemy. In the period from 17 April to 7 June 1943 the enemy lost 1,100 aircraft, more than 800 of which were downed in aerial combat. Soviet fighter losses totaled about 300 aircraft. Outstanding air combat experts A. Pokryshkin, brothers D. and B. Glinka, F. Fadeyev, V. Semenishin, G. Rechkalov, and many other Soviet aces distinguished themselves in this fighting.

The struggle for air supremacy reached a fever pitch in the Battle of Kursk. The fascist command authorities concentrated on the Kursk Salient the most battleworthy combined units of the 6th and 4th air forces. An additional approximately 400 aircraft were redeployed from Germany, France, Norway, and Poland. More than 2,000 of the 2,980 enemy aircraft on the Soviet-German front were designated for participation in the offensive operation. The Hitlerite command authorities intended to regain air superiority.

Hq SHC attached exceptional importance to bringing to an end the struggle for strategic air supremacy. Our aviation force grouping in the defense of Kursk totaled 2,950 aircraft and enjoyed an almost 1,5-fold superiority over the enemy. In order to weaken the enemy's aviation force groupings and to create favorable conditions for gaining air supremacy, three large-scale air operations were conducted in the southern and central sectors in April, May, and June 1943. Between 6 and 8 May, for example, six air armies took part in an air operation along a front extending 1,200 km. In scale and forces involved this was the largest air operation of the Great Patriotic War.

Air battles and engagements took on an unprecedented scale in the skies over Kursk. On 2 June, for example, 543 enemy aircraft took part in a massive raid on the Kursk rail center. The raid was repulsed by 386 Soviet frontal aviation and air defense fighters. A total of 104 enemy bombers were shot

down in the fighting. When the fascist forces shifted to the offensive, 175 multiple-aircraft engagements were fought on 5 July alone, in which the enemy lost 279 aircraft. In just a month and a half Soviet pilots destroyed more than 3,700 aircraft in the air and on the ground.

Our combat pilots demonstrated a high degree of combat proficiency, skilled mastery of their equipment, and an innovative approach to tactics. Radio was extensively employed in aerial combat for aircrew command and control. In the course of repulsing massive air attacks, the system of detecting enemy aircraft and warning friendly fighters, controlling them in the air, and organization of teamwork and coordination were improved, and new tactics were born.

The battles of Moscow, Stalingrad, the Kuban, and Kursk went down in the history of the Great Patriotic War as most important stages on the road toward gaining strategic air supremacy by the Soviet Air Forces. The Wehrmacht's offensive strategy suffered total ruin at Kursk. From that time henceforth, to the end of the war, strategic defense became the principal type of action by fascist Germany's ground forces and Luftwaffe.

The experience of the struggle for air supremacy was rapidly incorporated into the combat practices of aviation units. Three major forms of combat were clearly defined in Air Forces operational art: destruction of enemy air power during the conduct of daily combat actions within the framework of front offensive and defensive operations and between operations, special air operations aimed at defeating in detail (weakening) the enemy's aviation force groupings, and air battles. Destroying aircraft in the air was of determining significance thereby. This did not mean, however, that strikes on airfields were little-effective and were not of great significance. On the contrary, the Soviet command authorities mounted special air operations to destroy enemy aircraft on the ground. Slightly more than 2 percent of all combat sorties were devoted to this mission. A total of 13,000 enemy aircraft were destroyed on the ground, comprising approximately 23 percent of the total losses sustained by the fascists as a result of Soviet air actions. On the average five sorties were flown for every enemy aircraft disabled on the ground, that is, one fifth to one sixth as many as in air engagements.

The specific situation would exert considerable influence on choice of method of destroying enemy aircraft. As a rule strikes on airfields by large forces would be organized during preparation for strategic offensive operations. This would significantly weaken the enemy's aviation force groupings and would also sometimes sharply alter the relative strengths in favor of our aviation and would ensure a successful offensive by Soviet forces.

Bourgeois falsifiers of the history of World War II attempt by any and all means to play down the role of the Soviet Air Forces in defeating fascist Germany's Luftwaffe. They claim, for example, that Hitler's air power was allegedly critically weakened by British and U.S. bombing raids on aircraft plants, oilfields and synthetic fuel plants of Germany and its allies. An analysis of Allied combat air operations shows, however, that the Anglo-American command authorities had no desire aggressively to weaken the enemy's air power.

At the very height of the struggle between Soviet and fascist air power, British command authorities concentrated the principal efforts of their air forces on bombing residential districts with the aim of damaging civilian morale. A plan to destroy 43 German cities was formulated toward this end. At the same time strikes on cities pursued another objective as well -- to assure the Soviet Union that the "bombing offensive" was an adequate substitute for a second front and justified the extended postponements of an invasion of France by the Allies.

U.S. bombers commenced combat operations in Western Europe in August 1942. In contrast to the British, the Americans devoted more attention to demolishing industrial installations and transportation. According to the plan they had devised, the initial targets of airstrikes were shipyards and aircraft plants. Almost no strikes were flown against tank plants, although from the spring of 1943 the Hitlerite command authorities were devoting principal attention to building tanks, while cutting back on shipbuilding. Allied air attacks did not substantially affect the operation of Germany's tank and aircraft plants. Aircraft production in 1944, for example, increased to almost triple the 1942 figure.

Thus the war-fighting capability of Germany's Luftwaffe was sapped not by Anglo-American bombing raids but by the defeat in detail of Germany's finest aviation force groupings on the Soviet-German front.

Analysis of the battle for strategic air supremacy in the Great Patriotic War indicates that this task could be accomplished only by a nation with a powerful economic base. Thus the party Central Committee and the Supreme High Command, aware that in order to gain strategic air supremacy it was essential first and foremost to destroy the enemy's technical superiority in aviation, did everything possible to ensure that the production base and organizational structure of the Soviet Air Forces met the demands of the war and concentrated principal attention on establishing powerful aviation reserves and employing resolute forms of combating the enemy's air power.

The savage nature of the battle for air supremacy placed stringent demands on the level of training of flying personnel. Experienced combat veterans always led the younger men forward and served as an example for them. Hero of the Soviet Union fighter pilots alone downed more than 10,500 aircraft. This was almost one fourth of the fascist aircraft destroyed in air engagements. The ratio of air kills to combat sorties for these pilots was 3.5-4 times the average.

In combat defending the homeland Soviet aviation commanders, political workers, pilots and navigators, engineers and technicians displayed excellent moral-fighting qualities, courage and staunchness, and mass heroism. And the more complex and strenuous the combat environment, the more aggressively and purposefully political indoctrination work would be conducted. Love for the homeland, dedication to the party cause, and profound faith in victory over the enemy inspired combat pilots to accomplish valiant deeds, evoked aggressiveness and determination, and prompted initiative and combat innovativeness.

The outstanding victory by the Soviet Air Forces over fascist Germany's Luftwaffe was a result of the excellent organizing activities on the part of the Communist Party and Soviet Government to strengthen and develop all branches of the Armed Forces, and the heroic labor of our people, providing the Army, Air Forces and Navy with everything they needed for successful combat against the enemy.

The experience of the past war attests to the fact that air combat operations always began and ended with a fierce struggle to seize the initiative in the air. With the improvement in aircraft combat capabilities, improved accuracy of today's aiming devices and weaponry, with improvement of navigation and control systems as well as electronic countermeasures, the struggle for air supremacy becomes even more important in present-day conditions. Foreign military experts, for example, maintain that with the achievement of air superiority, the capabilities of ground forces increase severalfold. It is for good reason that the bulk of total flying hours logged at exercises conducted abroad is devoted to accomplishment of this mission.

The experience of the past war continues to demand attention and the most profound study, especially regarding the matter of gaining air supremacy.

3024
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AIR FORCE ACADEMY ACTIVE IN ELECTIONS TO SOVIETS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) p 20

[Article, published under the heading "24 February -- Elections to the Supreme Soviets of Union and Autonomous Republics and to Local Soviets," by Col I. Svetlov: "There Is No More Vivid Democracy"]

[Text] In his speech at the April (1984) CPSU Central Committee Plenum, CPSU Central Committee General Secretary Comrade K. U. Chernenko, chairman of the Presidium of the USSR Supreme Soviet, noted that "soon after the October Revolution V. I. Lenin stated the task of transforming the soviets into governmental directive bodies which would work not only for but also through the toilers. Today one is fully justified in stating that this task has been essentially accomplished. In this country the nation's affairs are handled by 2,300,000 deputies, representatives of workers, peasants, and intellectuals, the toilers of all nationalities and ethnic groups, and tens of millions of activists.

The correctness of this statement is confirmed by practical realities, by the triumph of socialist democracy. In contrast to the intellectual arms bearers of bourgeois democracy, for whom degree of democracy is measured by the level of political twaddle in parliaments, Marxist-Leninists place genuine meaning, proceeding from practical realities, into the term democracy. Democracy as we define it is sovereignty by the people, a genuine opportunity for the toilers to exert determining influence on the formulation and implementation of political decisions and fully to utilize all citizen rights and freedoms. "All power in the USSR," states our Constitution, "belongs to the people." The most important distinctive feature of socialist democracy lies in the fact that it is not limited to proclaiming the rights and freedoms of citizens but shifts emphasis to their actual embodiment.

This year's elections to the Supreme Soviets of union and autonomous republics and to local soviets are an important sociopolitical event. "In conditions of developed socialism," stresses the CPSU Central Committee decree entitled "On the 80th Anniversary of the 1905-1907 Revolution in Russia," "the role of the Soviets of People's Deputies becomes even greater. Born in the course of the first Russian revolution, they comprise the political foundation of our state and ensure genuine rule by the people. The soviets concentrate and direct the

productive energy of the broad masses toward accomplishing vital socioeconomic and political tasks. Their activities are in conformity with the interests of all classes and social groups, nationalities and ethnic groups, of all generations in the Soviet society."

The election campaign which is currently in progress in this country vividly characterizes the increased labor and social activeness of Soviet citizens, including the armed defenders of the Soviet nation, in the campaign to strengthen the economic and defense might of the homeland, and convincingly demonstrates the indissoluble unity of the party and people, the monolithic nature of our society and the firm strength of Soviet nationhood.

Our valiant military aviators are greeting the elections with great political and labor enthusiasm, together with the entire Soviet people and the fighting men of the other branches of the USSR Armed Forces. Taking active part in socialist competition under the slogan "Our Selfless Military Labor Dedicated to the 40th Anniversary of the Great Victory and the 27th CPSU Congress!", they are increasing their successes in combat and political training, are directing their political activeness toward further increasing the combat readiness of the Air Forces, and are preparing to honor in a worthy fashion the 115th anniversary of V. I. Lenin's birth, the 40th anniversary of the Victory by the Soviet people in the Great Patriotic War, and the 27th Congress of our Communist Party.

...We entered the spacious, bright and cheerful room housing the agitation center of the 43rd Voting Precinct, situated in the Officers' Club at the Air Force Engineering Academy imeni N. Ye. Zhukovskiy, accompanied by political section officer Lt Col V. Kul'skiy and academy instructor Candidate of Technical Sciences Col A. Kolomeytsev, chairman of one of the precinct electoral commissions. The administration, political section, faculty and students at this nationally renowned aviation higher educational institution have accomplished a great deal of work connected with preparing for and holding elections on a high ideological-political and organizational level. Of course special responsibility was borne by those who are directly participating in district and precinct electoral commissions, as well as by the large body of agitation-propaganda activists, who for the most part are students enrolled at the academy.

The agitation center is crowded. The walls display materials revealing the essence of socialist democracy and the Soviet way of life, a specific-topic selection of materials on the achievements of the Soviet people in building communism, as well as counterpropaganda articles and pamphlets. One's attention is drawn by an exhibit of literature devoted to the 100th anniversary of the birth of M. V. Frunze, after whom this rayon in Moscow is named. Lying on tables are files of central newspapers and magazines as well as the academy newspaper, VPERED i VYSHE.

"Utilizing a selection of literature and reference aids, our agitators conduct explanatory work from the beginning of the election campaign among the local residents and academy personnel, who on election day will vote for the candidates of the indissoluble bloc of Communists and party-unaffiliated," stated Maj A. Manuchar'yan, in charge of the activities of the agitation and

propaganda team of one of the faculties, and presented to us agitators Sr Lts V. Derbenev and S. Tupik.

"These future Air Forces engineers," Arsen Sergeyevich continued, "incidentally, just as many other students, have recently given talks at the agitation center on the democratic spirit of our electoral system, the constitutional rights and obligations of Soviet citizens, the achievements of the toilers of Moscow and Moscow's Frunzenskiy Rayon, and of course about our candidates for the soviets."

"In general we in the academy's political section," Vadim Vladimirovich Kul'skiy entered the conversation, "correctly consider the current election campaign to be a component part of our training and indoctrination process. Participation in such a political activity helps the students acquire solid pedagogic skills and methods techniques and helps them become ideologically toughened. And as we know, these qualities are extremely essential to today's aviation engineer and indoctrinator of aviation engineer service specialists...."

I continued our discussion on what had been accomplished on the eve of the elections on the premises of the voting precinct with Colonel Kolomeytsev. This officer has plenty of experience in volunteer work. In recent years Aleksandr Konstantinovich has continuously headed one of the precinct electoral commissions and is highly respected by his colleagues and the voters.

I asked him to discuss the features of this year's election campaign. Aleksandr Konstantinovich stressed that the party works tirelessly to equip the toilers and Soviet servicemen with a high degree of political knowledgeability and develops in them a profound understanding of their constitutional rights and obligations, that daily Soviet life is filled with examples precisely of such an approach by citizens toward the job at hand, toward their obligations to society.

"For example, our Communists and all academy personnel," the officer continued, "preparing for this next party congress and the 40th anniversary of the Great Victory, analyzing what has been achieved, are displaying heightened sociopolitical and production activeness. All teachers and students, officers, warrant officers and enlisted personnel, as well as Soviet Army civilian employees have come to election time with excellent labor results. The source of their activeness is seen in awareness by each individual of his personal involvement in the successes of the socialist homeland, in a firm conviction that his voice will be heard, that a practical suggestion and useful initiative will not go unheeded. This awareness and confidence give added energy and develop the aspiration to move forward, to achieve more."

"I should like to hear about those who together with you will soon be greeting first voters."

"They are true enthusiasts," Aleksandr Konstantinovich perked up. "Take Soviet Army civilian employee Ul'yanin, who is in charge of the engineering thesis room of one of the departments. This party member has repeatedly

served as precinct electoral commission secretary. Currently he is a commission member, but he is continuing to give every possible assistance to the new secretary, Captain Yeliseyev. Many good things can also be said about Candidate of Technical Sciences Lieutenant Colonel Yevdokimov, an experienced chairman of the district electoral commission for elections to the Moscow City Soviet. Or, for example, there is the chairman of the district electoral commission for elections to the Frunzenskiy Rayon Soviet, Lieutenant Colonel Novakovskiy...."

"Are there activists who, let us say, have not served on electoral commissions but take part in preparations for elections?"

"There are quite a few people in this category. And I believe that here we find the main significance of genuine democracy in our country. I shall be correct in stating that even in the example of our academy one can see the entire scope of participation in the election campaign by broad strata of the public. I shall just name a few aviation personnel who at the behest of their hearts took part in preparations for the election. They include twice Hero of the Soviet Union Major General Aviation Sivkov, colonels Kupnevskiy and Petrenko, Lieutenant Colonel Pavlenko, Soviet Army civilian employee Moiseyev, students senior lieutenants Soldatov, Ul'khov, Tolkachev, and others.

As I was leaving the voting precinct at the Air Force Engineering Academy imeni N. Ye. Zhukovskiy, I happened to think about the fact that almost 50 years ago M. Gor'kiy called Soviet democracy the most brilliant and humanitarian democracy on earth. Today's Soviet realities eloquently attest to the fact that it has now become even more brilliant, mature in its forms, and is revealing more and more new opportunities for involving the masses in actual governance of societal and governmental affairs. An example of this is the present activeness of Soviet citizens and military personnel, who are proudly voting for worthy candidates for deputies to the Supreme Soviets of union and autonomous republics and to local soviets.

3024
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FIGHTER LANDING APPROACH ERROR ANALYZED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 28-29

[Article, published under the heading "Constant Attention to Flight Safety," by Military Pilot 2nd Class Capt B. Kononenko: "Effect of Flight Analysis"]

[Text] Quality control of task execution with the aid of airborne and ground recording devices has become an integral part of aviator flight training. Utilizing objective monitoring means, an instructor can spot unobvious mistakes and errors made by the pilot during a flight, can analyze them and devise effective measures to prevent future errors. And an instructively conducted post-mission analysis is not only a method of preventing various violations of flight regulations but also a good school of indoctrination.

I recall the following incident. A fighter was on landing approach. The pilot was keeping precisely on glidepath, but after crossing over the middle marker the aircraft suddenly began descending rapidly. The flight operations officer spotted the deviation in time and ordered him to advance his throttles. The fighter passed over the near-end runway overrun at a high angle of attack and crossed the threshold much too high. The aircraft touched down far down the runway.

Flight commander Capt V. Martsenyuk observed the landing. The fighter was piloted by his subordinate, Lt A. Zharenko. Glancing at his watch, the officer hastily headed toward the aircraft, which had taxied to the centralized refueling point. "Why did Zharenko err?" he thought to himself. "Did he improperly distribute his attention on final? Did he incorrectly select his point of roundout? Did he fail to take wind velocity and direction into consideration?" He had to get to the bottom of things immediately, for otherwise he could not release the pilot for a subsequent sortie.

The lieutenant was in no hurry to climb out of the cockpit. Obviously he himself was trying to determine the reason for the poor landing. The fact is that self-analysis is a good aid in training. Martsenyuk knew this, and therefore he did not hurry his subordinate. Finally the latter climbed down onto the concrete.

"Comrade Captain...," he was about to report the incident, but the flight commander checked him: "I saw your landing. What was the problem?"

The pilot hastily began to explain: "After crossing over the middle marker, as usual I determined the roundout point. I was too quick in increasing my rate of descent. At this point I also failed to monitor altitude, and when I glanced at the altimeter it was too late. I added throttle on orders from the tower. My airspeed on glidepath picked up...."

The lieutenant's reasoning was correct, and his reply essentially satisfied the flight commander. Nevertheless Captain Martsenyuk instructed Zharenko to climb back into the cockpit and demonstrate his actions from the moment when in the pilot's opinion the initial mistake was made.

As he described his procedures, the pilot manipulated the controls as he had in the air. At the moment when he was 1 kilometer from the threshold, the flight commander suddenly stopped him: "Stop! Go through it once more."

The pilot thought for a moment, but then proceeded from the beginning. And once again, upon reaching that instant specified by Captain Martsenyuk, he was stopped.

"Here's the thing," the flight commander stated. "You have not yet noticed two mistakes. First of all, upon reaching the outer marker you were late in reducing power and, secondly, you added throttle on instructions from the tower without analyzing how much throttle to add. Consequently the error crept in not when you crossed the middle marker, as you presumed, but much earlier -- over the outer marker."

The officers headed for the flight recorder tape processing room. The specialists on duty had already processed the flight recorder tapes. They located the final approach segment. Determining from the time lines the moment of outer marker passage, the flight commander determined airspeed, altitude and rpm at this point. They were within normal landing approach configuration. But beyond that the rpm line continued unchanged for some time. This was the pilot's first mistake. The altitude line proceeded smoothly up to the middle marker, followed by a moderately sharp bend, which once again was followed by a gentle slope. Airspeed to the middle marker was high. The tape clearly showed an increase in rpm.

They again measured parameters. They determined from the calibration curve that engine rpm after crossing the middle marker was almost the same as at the moment of outer marker passage. This means that airspeed also had to be excessively high.

The flight commander also noted other deviations which taken together led to the poor landing. This was discussed the following day during a flight performance analysis in the squadron. Flight recorder tapes analysis team specialists Sr Lt V. Anikanov and WO V. Volkov had by this time prepared flight recorder tape data on an enlarged scale and had plotted them on graph paper. Lieutenant Zharenko, analyzing his errors, described in detail his landing approach procedures.

"Was a normal landing possible after the flight operations officer intervened?" the flight commander asked the pilots.

They replied in the affirmative without hesitation. If Zharenko had responded in a precise and composed manner, the error could have been corrected. All he had to do was bring back his throttles a bit, and airspeed would have dropped to the prescribed level. But opinions differed in replies to this same question regarding the situation over the middle marker. The majority were of the opinion that the aircraft's performance characteristics and engine response would have made it possible to put the fighter down on the numbers.

To back up their statements, the pilots analyzed the flight on the basis of the tapes. At a certain point Zharenko had stopped monitoring altitude and had failed to note (as he himself explained) the increase in sink rate. Two seconds later he applied throttle, as the tower had instructed, but much more than was required. At this point he was already coming in a bit hot. To this was added a tailwind component, which the lieutenant also failed to consider. In order to hold the aircraft on glidepath it was necessary to add throttle, but in such a manner as to compensate for loss of airspeed as a consequence of increasing his angle of attack. In this instance, however (this was evident on the tape), the fighter stopped dropping below the glidepath, but its airspeed remained high, and subsequently increased. This can clearly be seen on the flight recorder tapes. The flight's pilots concluded that in adding power, Zharenko failed to monitor airspeed. One might ask if too much discussion is not being devoted to a landing which in fact ended safely. The answer is no. Both the flight commander and squadron commander devoted considerable attention to this incident because similar errors were noted on the part of some young pilots. A detailed analysis helped find the actual causes of the poor landing and helped devise measures to prevent errors.

That day the pilots went through a cockpit practice drill. The flight commanders closely monitored their handling of the controls, explaining the physical significance of each action. They devoted particular attention to smoothness of throttle adjustment and distribution of attention on final approach glidepath.

During subsequent flight operations Capt V. Martsenyuk specifically went to the tower to observe Lt A. Zharenko's landing. A black dot appeared over the horizon in the distance. It grew in size with each passing second, taking on the shape configuration of an aircraft. It was proceeding smoothly, as if gliding along an invisible thread. And when the fighter's wheels produced little puffs of smoke as they touched down in the precision landing zone just beyond the runway threshold, the flight commander said to himself: "Good man! Right on the numbers." The commander was also pleased by the fact that the pilot's comrades had also learned a lesson from his error. That day none of them made a single mistake on landing.

3024
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AVIATION ENGINEER SERVICE SUPERVISOR QUALITIES ASSESSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 30-31

[Article, published under the heading "The Reader Continues the Discussion," by Maj Gen Avn A. Shelekh, deputy commander of air forces and chief engineer of air forces of the Red-Banner Far East Military District: "Engineer on the Airfield"]

> [Text] In the article "Squadron Engineer. What Should He Be?" (AVIATSIYA I KOSMONAVTIKA, No 11, 1984), Maj Gen Avn A. Grishin addressed what in my opinion is a very pertinent subject. Today, when major changes have taken place in the development of weaponry, and modern aircraft systems have risen to a qualitatively higher level, the role of aviation engineer service supervisors at the squadron level has increased immeasurably.
>
> Before discussing this category of officer personnel, however, I believe that one might do well to discuss those who train and indoctrinate on a daily basis the squadron deputy commanders for aviation engineer service, those who work painstakingly to develop in them excellent moral-psychological and professional qualities.

When I visit the regiment in which the aviation engineer service is headed by Lt Col G. Fetisov, I always note with satisfaction the high degree of proficiency on the part of specialist personnel. They do a fine job of combat equipment maintenance and utilizing test equipment and objective monitoring devices. They have recently refurbished training facilities. They include new diagrams, training simulators, working-model displays, and unique visual aids. This high-quality training complex helps aviation personnel increase their technical knowledge and boost their flying, weapons, tactical, as well as technical proficiency. The most serious attention in this regiment is devoted to technical training of personnel and instilling in the men a careful attitude toward combat aircraft systems and an endeavor to avoid wasting equipment useful life. The unit's engineers, particularly the deputy commander for aviation engineer service, unquestionably play an important role in this work.

The principal work station of the aviation engineer is at the airfield. Here he has at his disposal inexhaustible opportunities to increase his professional knowledge and to reveal his abilities as a work organizer and indoctrinator of his subordinates. The engineer is more familiar that other personnel with an aircraft's design and construction, its armament, flight and navigation gear, automated control systems, powerplant, as well as the documents which specify the rules and procedures of operation and maintenance of an aircraft of a given type. He should ensure conscientious observance of technical, operating and maintenance requirements and should show his men a personal example in this important matter.

Lt Col G. Fetisov spends a good deal of his on-duty time at the airfield, concerning himself with maintaining aircraft systems in constant working order and combat readiness. This officer values every minute of training, precisely organizes aircraft servicing and maintenance, conducts verificational inspections, analyzes the data from objective monitoring devices, helps squadron deputy commanders for aviation engineer service conduct preliminary and preflight preparation of aircraft equipment for flight operations shifts on a scientific basis, and actively monitors and verifies operation and maintenance of training complex equipment.

Party member Fetisov structures his relations with subordinates on a foundation of properly prescribed demandingness and a respectful attitude toward others. In his dealings with the men he is always tactful, sensitive, and attentive. It is quite understandable that people are drawn toward such an officer-leader, confer with him on personal and job-related matters, and share their innermost secrets.

As we know, the reputation and prestige of an aviation engineer service depends in large measure on who heads it. If a military engineer is ideologically convinced, with an innovative bent, and is dedicated to his job, the team under him will invariably de distinguished by organization and discipline and will enjoy considerable respect. And this is important, especially today, when Air Forces subunits are receiving aircraft with a higher thrust-to-weight ratio and improved aerodynamic characteristics. Weapons aiming and navigation systems, flight and navigation instruments and avionics systems have increased their combat capabilities and overall punch severalfold.

Who if not an engineer should be an organizer of learning to master new aircraft systems in a short period of time? This faces him with serious problems. He must be knowledgeable in matters of scientific and technological advance, and he must work with an eye to the future. Precisely these qualities characterize Lt Col G. Fetisov, as they characterize, incidentally, other of our engineers. Of the great diversity of measures which must be carried out on a daily basis, they have the ability to note the main point and concentrate their principal attention on it. And today an engineer cannot delay something, be late somewhere, diminish demandingness on himself and his men, or count on past knowledge and past achievements.

The development of technology and weaponry as well as the complexity of the international situation give us no right to complacency. It is gratifying that vanguard engineers of the district's air forces well understand these changes and are conscientiously performing their difficult duties. Officers M. Yen'kov and V. Ushenko, for example, have a good reputation. They possess broad technical knowledgeability and work persistently to improve their skills. They are rarely to be found at headquarters -- rather than cozy offices, they prefer flight lines, maintenance areas, technical maintenance unit laboratories, training simulators, and practice drills in airplane and helicopter cockpits. These engineers are always to be found among line aviation personnel. For them the main things are people and equipment and their continuous combat readiness.

V. I. Lenin, the founder of our party and the Soviet State, taught Communists to have the ability to isolate the most important thing and concentrate all their attention on it. His instructions and behests pertaining to defense of the socialist homeland have taken on particular importance in present-day conditions, when our country is carrying out a large complex of socioeconomic transformations as specified by the 26th CPSU Congress and subsequent CPSU Central Committee plenums. It is important that the aviation engineer who marches in the vanguard of scientific and technological advance, constantly and continuously work to master a Leninist work style.

Unfortunately at times some officers take too long to get moving. And yet it is necessary maximally to concentrate people's efforts on mastering new combat equipment, which incorporates the latest advances in scientific thinking. Success here depends in large measure on moral-psychological attitude, on the persistence and purposefulness of aviation personnel, and awareness of personal responsibility for maintaining combat readiness at a high level. Of course precise organization of the men's training is essential, a task which should be handled by the commanding officer, staff officers, and unit engineers. This task cannot be accomplished in a short period of time without active participation by the party and Komsomol organizations. The mobilizing role and personal example of Communists and Komsomol members assume paramount significance in such an important matter. The aviation engineer should take all this into account in his job-related activities.

In a number of documents the party Central Committee has seriously addressed the fact that persons who are entrusted with supervising various production sections are called upon to work tirelessly to improve leadership methods and style. They should possess in full measure a sense of the new, display initiative, and utilize in a prompt and timely manner all scientific and technological advances. This also applies in full measure to aviation engineer cadres. All their activities should conform to party standards.

In this connection I should like to emphasize the considerable importance of an engineer's professional competence. New aircraft systems, with extensive employment of cybernetics, electronics, and modern weaponry, have enhanced as never before the role of technical training of supervisor personnel proper. The degree to which an officer has mastered a piece of equipment and his knowledge of it determine in large measure expert employment of the aircraft

system by his subordinates, flight safety, and savings in equipment operating life and fuel consumption.

Party member officer V. Mikhalev has proven to be an engineer-supervisor with initiative. He headed a unit aviation engineer service during a critical period when the men were proceeding to master what for them was a new aircraft system. The situation required introducing methods innovations into the training process. Parallel with this, the engineers had to accomplish a large number of technical tasks. The aviation engineer service specialists had a lot of work to do at the time. Success depended in large measure on the efficiency of the deputy commander for aviation engineer service, his purposefulness, engineering knowledgeability, composure, and persistence in working toward a stated objective.

Party member Mikhalev did everything necessary to reequip training facilities in a short period of time, to build new display stands, working-model training devices, and models of the most complex airframe and powerplant assemblies and systems. Under his supervision skilled personnel equipped training simulators and working-model display stands simulating operation of aircraft systems and equipment, completing the work on schedule. The men's work performance received high marks from the commanding officer and party committee members.

In this unit they set about to solve difficult problems jointly and to assist one another by word and deed. The engineers of the services, the party and Komsomol organizations constantly keep an eye on matters pertaining to technical training of aviation personnel and instilling in them an affection for and careful attitude toward aircraft equipment. They conduct dissemination of military-technical knowledge actively and purposefully, they have skillfully organized the campaign for exemplary maintenance of aircraft systems, and they have done a good job of organizing efficiency innovation work aimed at improving training facilities and at seeking and finding techniques which improve maintenance and operation of aircraft systems and armament. A systematic character to the work of aviation engineer service officers is of great importance here as well.

Once one of the engineers suggested visiting a neighboring unit to see how they had set up an equipment and armament planning office. Officer Mikhalev was pleased at his men's initiative. He acquainted himself with the experience of the neighboring unit and skillfully utilized it in his own practical activities.

"Strict, but attentive and sensitive toward others" -- this comment appeared in V. Mikhalev's fitness report. And it is a correct observation. This officer is constantly concerned with developing ideologically conditioned, knowledgeable aviation personnel. Party member Mikhalev has now been promoted and is working in a new duty assignment, passing on his wealth of experience in mastering aircraft equipment to his subordinates.

An important role in organizing technical training is assigned not only to the commanding officer but also to the unit's engineers. Their duties include holding training classes with flying personnel and aviation engineer service specialists, presenting reports at flight-technical conferences, and taking

part in discussing at meetings of the unit's methods council pertinent matters connected with further improving the quality of operation and maintenance of modern aircraft equipment. And the more responsible and businesslike an engineer is, the more he is respected and the greater the results generated by his difficult military labor.

It would be erroneous to believe, however, that the reputation of an aviation engineer service supervisor depends solely on the depth of his specialized knowledge and professional competence. This is only one aspect of the matter. Another, no less important aspect consists in establishing party-mindedly firm, meaningful relations in the outfit. This means that as regards rules and regulations governing operation and maintenance of aircraft equipment and strict observance of appropriate regulations and shop manuals, the engineer must not depart from the requirements of guideline documents or display a lack of principles. A disseminator and publicizer of everything new and progressive, the aviation engineer at the same time is a champion of strict job process discipline and the demands of regulations pertaining to maintaining equipment and weapons. Implacable opposition toward deficiencies in things large and small and the ability to understand one's subordinate and share his concerns are components of a good name and good reputation of an aviation engineer.

I have known Maj A. Bokhan for several years now. This officer heads a maintenance subunit. He works conscientiously and with great inspiration. If a problem crops up, he works persistently to find a way to correct the problem. His purposefulness and ability to mobilize his men produce good results. Not long ago they reequipped an insulated bay in the subunit, which made it possible to shelter all the equipment. This officer's subordinates displayed a good deal of inventiveness and initiative in furnishing the shops with the requisite equipment for repairing aircraft engines. Major Bokhan plays a leading role in all undertakings. Incidentally, he has personally repaired several engines. Following the example of their supervisor, his men successfully restore to service complex radar gear, extending its service life. Firm observance of regulations is followed in the subunit, discipline is strong, and the level of technical sophistication is high. The outfit received a mark of excellent for last year's performance results.

Of course in any undertaking it is not words and good intentions which predetermine success but rather the end result of the men's labor, their persistence and purposefulness. Unfortunately one still encounters engineers who in their words are ready and willing to move mountains, as they say, but in actuality you hear nothing but unfavorable criticism leveled at them for their miscues. Therefore people's attitude toward such supervisors also changes, which adversely affects both their reputation and the outfit's overall success.

Something of the kind occurred with officer V. Popov. At one time he had demonstrated himself to be a promising engineer. He was promoted, was cited in orders on numerous occasions for successful performance in combat and political training, and he won prizes. And Popov became conceited, gradually losing his qualities of efficiency and, in addition, developed a weakness for

alcohol. Naturally his future career as an officer came into question. This is unquestionably a rare occurrence, but it forced us to draw a lesson.

We have recently been devoting serious attention to the training and indoctrination of engineers. Toward this end we regularly hold instruction methods training conferences, at which we examine in detail matters pertaining to the engineers' job-related activities and their role in the successful mastery by aviation personnel of modern fixed-wing and rotary-wing aircraft and in further increasing the combat readiness of the subunits.

We strive to ensure that each and every aviation engineer service supervisor serves in a practical way as an example for his subordinates in meeting adopted socialist pledges in honor of the 40th anniversary of the Victory of the Soviet people in the Great Patriotic War and honoring the 27th CPSU Congress in a worthy manner.

3024
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POTENTIAL HAZARDS OF DESCENDING MANEUVER PULLOUT ANALYZED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 32-35

[Article, published under the heading "Practical Aerodynamics for the Pilot," by Candidate of Technical Sciences and Docent Col (Res) V. Zhulev and Candidate of Technical Sciences Lt Col N. Kurnyavtsev: "In a Descending Maneuver"]

[Text] When examining flight recorder (BUR) tapes between flights, analysts frequently discover that an aircraft had descended to altitudes lower than those at which they should have been flying. An excessive loss of altitude, which threatens flight safety, is encountered more frequently in those phases of a sortie when the pilot, performing certain operations, is diverted from monitoring his altitude. In certain cases it is difficult to determine the reason for failure to observe safe flying conditions during the performance of descending maneuvers, especially if the aircraft carries SARPP-12 flight recorders, which do not record lateral channel data.

...The pilot was performing flight maneuvers at a rapid pace: steep climb, dive, normal loop, chandelle, descending spiral, Immelmann, and half-roll. After the fighter landed, analysts noted in inspecting the flight recorder tapes that following the half-roll the aircraft was brought back to level flight at an excessively low altitude.

Analyzing the reason for the aircraft descending to an altitude below Hsafe, the regimental commander drew attention to the fact that in the process of pulling out of the descent the angle of attack limiter (OUA) repeatedly kicked in. In other words, the aircraft was being flown at the limit of its maneuver capabilities. The pilot in turn commented that in his opinion the angle of attack had been less than the maximum recommended value. He concluded from this that in limiting the maximum angle of attack, the OUA reduces the maximum attainable g-load, and therefore brings the pullout altitude too low. Was the pilot correct in his belief that intervention by the OUA system in controlling the aircraft was the reason for failure to maintain safe flying conditions?

At this point we should recall the operating principle of an automatic OUA system. When the angle of attack increases to alpha-ac, a signal is generated and applied to an actuating mechanism, which deflects the stabilizer and

control stick in a pitch-down direction. Additional force Poua must be applied to hold the control stick in position. If the pilot does not act to prevent it from moving, the aircraft's angle of attack decreases to a value alpha-1, the signal is no longer applied, and additional forces are removed from the controls.

If he again pulls back on the controls, the angle of attack will once again increase to alpha-ac, and the OUA will once again kick in. As a rule the angle at which the OUA actuates is slightly less than the maximum allowable, while its magnitude depends on the rate of change of alpha, that is, the higher it is, the earlier the limiter kicks in. Thus it impedes the aircraft from reaching stall angles of attack in the transition process during abrupt maneuvering. The angle of pitch-down stabilizer deflection and angle of attack alpha-1 at which the additional forces are removed from the control stick are selected in such a manner that the average angle of attack during maneuvering is close to the maximum allowable, with its overswing value as small as possible, in the transition process not exceeding the stall angle of attack.

Indicators of OUA actuation on a SARPP-12 tape (Figure 1): sharp pitch-down stabilizer deflection and single command "critical angle of attack" superimposed on the indicated altitude line. The OUA cut in at time t1, t2, t3, t4, and t5. The first time (t1) was with smooth rearward pressure on the stick, while the four subsequent occasions were with abrupt control stick deflections. Therefore the normal g-load during t1 is close to the maximum allowable, while in the other instances it is less. Each time during g-load overswing the aircraft went to ny>nyadd. In Figure 1 the light solid line indicates average g-load level reached during pullout from a descending maneuver. The difference (Delta-ny) between maximum allowable and mean normal g-load characterizes that decrease in aircraft maneuver capabilities during actuation of OUA indicated by the pilot. The average angle of attack during abrupt maneuvering and actuation of the OUA, however, differs little from the maximum allowable, and therefore quantity Delta-ny is insignificant. As we know, normal g-load is connected with lift coefficient by the relation:

$$ny=Cy \times q/G/S,$$

where q is dynamic pressure; G/S -- wing loading (see Figure 1 on following page).

Cy is connected to angle of attack by the relation contained in Figure 1 on the back cover [not reproduced]. It follows from the formula that when maneuvering at high indicated airspeeds (large q), an aircraft reaches maximum g forces at angles of attack far from stalling, and therefore the OUA does not cut in.

Figure 2 on the back cover [not reproduced] shows the relation ny=f (Vnp). When flying at indicated airspeeds below V np.gr, maximum g forces are limited by the OUA by below-stall angle of attack, and at speeds greater than Vnp.gr -- by strength condition.

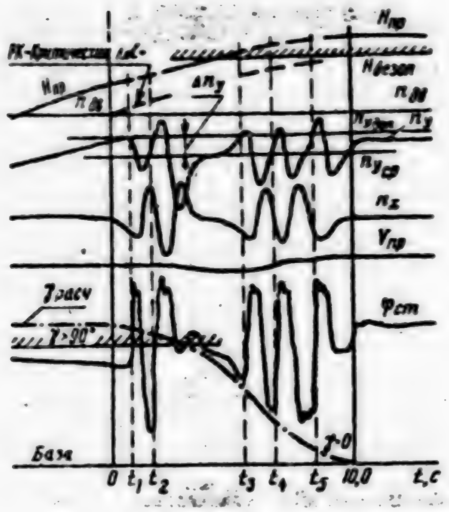

Figure 1. SARPP-12 system record of flight parameters during execution of descending maneuvers

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An identical increase in alpha during flight at low and high angles of attack gives different increments Delta Cy (Figure 1 on back cover) [not reproduced], whereby Delta Cy1>Delta Cy2 due to flattening out of curve Cy=f (alpha) at high angles. Therefore when the OUA cuts in, the average angle of attack during maneuver alpha-cp, corresponding to normal load factor nycp, differs from maximum allowable alpha-dop, corresponding to nydop, by a fairly large amount, but Cycp, corresponding to alpha-cp, differs little from Cydop. Since indicated airspeed where the OUA system cut in remained virtually unchanged, in this segment a decrease in Cy by Delta Cy equals approximately 0.045, led to a decrease in normal load factor by only Delta ny=0.2, which comprises approximately 3-4 percent of nydop. Altitude of recovery from descending maneuver decreases thereby by only 20-25 meters in comparison with loss of altitude during pullout with nydop. According to the SARPP-12 tape, the aircraft was pulled out from the descending maneuver 200 meters below safe altitude. This means that one cannot state that such a loss of altitude was caused only by a decrease in the aircraft's maneuver capabilities during abrupt maneuvering and actuation of the OUA.

Then what is the reason? A comparison of SARPP data during execution of half-rolls in the analyzed and preceding flights indicated that the pattern of change in airspeed was approximately identical, altitude of initiation of maneuver in the analyzed flight was somewhat higher than in the preceding flights, and normal load factors are approximately identical prior to initiation of pullout from a descent maneuver, and even somewhat more during pullout in the analyzed flight.

Analysis indicated that the pilot had commenced pulling his aircraft out into level flight from a steep bank. In Figure 1 the dot-dash line shows the calculated bank angle values. At time t1, t2 (the first two OUA actuations)

the bank angle exceeded 90 degrees, and any pullout from a descent maneuver was out of the question. Figure 3a on the back cover [not reproduced] shows the forces acting on the aircraft with a bank angle exceeding 90 degrees. In this case the components of lift Y cos gamma and gravity G cos Theta are directed downward, that is, bend the groundward trajectory, toward a further increase in the dive angle.

At time t3, t4, t5 (the last three OUA actuations) the bank angle was less than 90 degrees. Figure 3b on the back cover [not reproduced] shows the forces acting on the aircraft. Here the lift component is directed upward. To pull out from a descending maneuver it is essential that it be greater than weight component G cos Theta, that is, the following condition must be met:

ny > cos Theta/cos gamma.

For example, to pull out of a descending maneuver with flight-path angle Theta=-50 degrees with a load factor of ny=6, the bank angle should be less than 83 degrees. The smaller the bank angle, the less altitude will be lost. Minimum loss of altitude naturally occurs when gamma=0. Thus the principal reason for aircraft pullout below safe altitude is the steep bank.

The altitude record markings on the SARPP tape contain specific features with which one must be familiar. Indicated altitude is recorded in steps, while altitude values during transition from one step to the next are determined by the direction in which altitude changes (Figure 2a, b). It is understood thereby that indicated airspeeds are identical, and one is examining a single range of distances of steps from the datum line. In the first instance, for example (Figure 2a), one sees an increase in the length of record line Hnp from 20 mm (preceding step) to 20.8 mm (following step), and in the second (Figure 2b) -- a decrease from 20.8 mm (preceding step) to 20 mm (following step). For a more accurate interpretation of indicated altitude during execution of descending maneuvers, one must utilize not averaged calibration altitude data but only that which corresponds to altitude change from Hmax to Hmin, that is, by "reverse run." True altitude is determined with the expression: Htr=Hin+delta Haw+delta Hdel, where Hin is indicated altitude recorded by the SARPP-12; Delta Haw -- aerodynamic and wave corrections; Delta Hdel -- correction for delay.

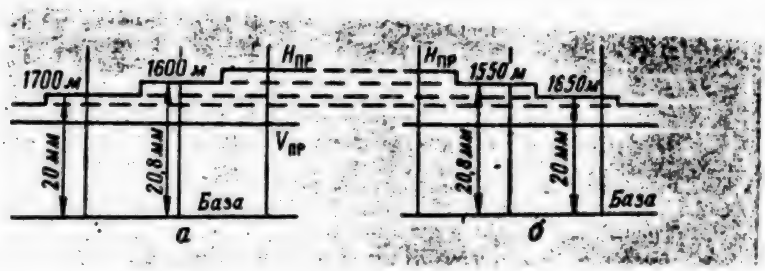

Figure 2. SARPP-12 system altitude record: a) during descent; b) during climb

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One obtains value delta Haw and delta Hdel by utilizing the Hin and Vin interpretation data, as well as the equations contained in the aircraft's

technical description. By taking into account the peculiarities of the record, one can discover slight violations of safe minimum altitude.

During analysis of the flight, the commander was asked about the role of the automatic control system (SAU) in such instances.

As we know, "passive" or "active" automatic devices are employed to increase flight safety. "Passive" devices warn the pilot on approach to a dangerous altitude with an aural signal or flashing light. "Active" devices act upon the control surfaces and prevent the aircraft from reaching a dangerous altitude. On this aircraft, to prevent reaching an altitude below Hsaf, the SAU could operate only in Return To Level Flight or Leave Dangerous Altitude modes.

In Return To Level Flight mode information from sensors defining aircraft configuration, angle of attack, bank and pitch angles, airspeed and normal load factor, is fed into a computer (Figure 3), which generates pitch axis control deflection signals. If the bank angle exceeds 80 degrees, a control element (UE) first forms a roll axis control deflection signal to decrease the bank angle, and when the bank angle is less than 75-80 degrees -- a pitch axis control deflection signal (as stated above, when gamma exceeds 90 degrees a pitch-up stabilizer deflection increases loss of altitude). When pitch angle becomes greater than zero, signals are no longer applied from the SAU actuator (IE) and the aircraft enters horizontal flight.

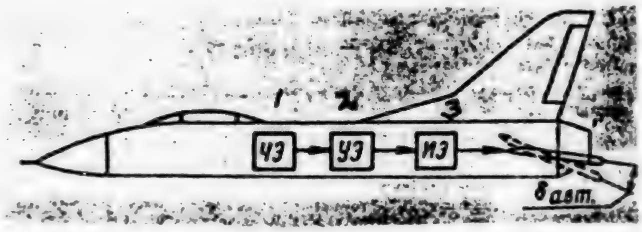

Figure 3. Operating principle of automatic control system

Key: 1. Sensor; 2. Control element; 3. Actuator

Leave Dangerous Altitude mode differs somewhat. Roll axis controls (reducing gamma to zero) and pitch axis controls deflect on control element command, beginning at a certain altitude which the pilot considers dangerous and himself specifies in conformity with the nature of the terrain and mission. Automatic control system actuator signals are no longer applied when altitude crosses the danger boundary while climbing. In Figure 4 the dashed lines indicate flight parameters during SAU operation in Leave Dangerous Altitude mode. Section 1-1 corresponds to SAU switching into this mode when the aircraft descends to dangerously low altitude. In section 2-2 the bank angle has decreased to 90 degrees, in section 3-3 the pitch angle has become somewhat greater than zero, while section 3-3' corresponds to the moment when flight altitude has become greater than "dangerous" altitude.

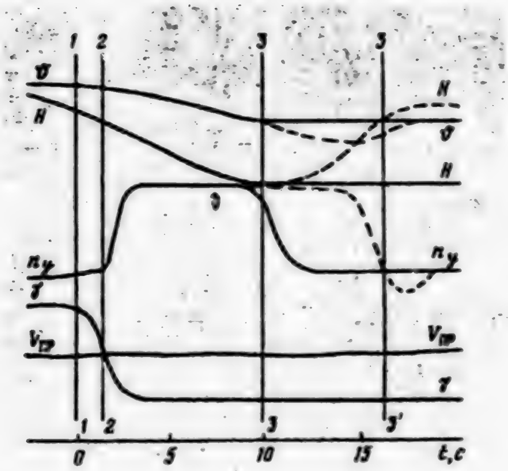

Figure 4. Flight recorder record of flight parameters during aircraft pullout from a descending maneuver by automatic control system

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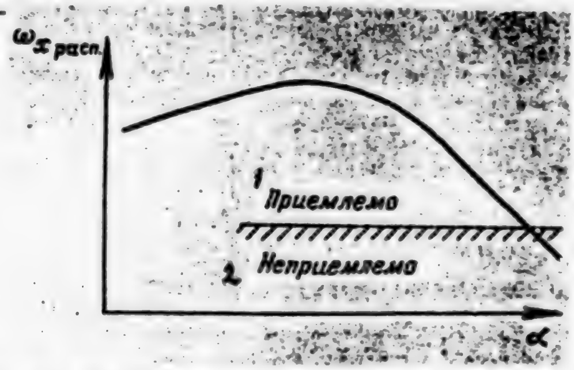

Figure 5. Character of relation omega-pos=f(alpha)

Key: 1. Acceptable; 2. Unacceptable

The magnitude of normal load factor recorded when the SAU is operating in Return To Level Flight and Leave Dangerous Altitude modes (it is usually called prescribed load factor) depends on aircraft configuration and airspeed. Maximum ny is set somewhat lower than that defined by maximum allowable angle of attack or the aircraft's strength properties (dashed line in Figure 2 on the back cover) [not reproduced]. This is done to ensure that in the process of aircraft pullout from a descending maneuver with the aid of the SAU it does not enter stall conditions or reach a load factor limited by the aircraft's structural strength, particularly in rough-air conditions. Precisely for this reason recovery maneuvers in automatic mode take longer than with manual control.

SAU actuators, in order to ensure flight safety in cases of malfunction, usually consist of two servos: a fast servo, with a narrow range of control

deflection, and a slow servo, with a broad range. Transition occurs according to the following principle: initially the control is deflected to a certain small amount by the fast servo, and then by a greater amount by the slow servo. Sometimes a single-servo arrangement is also used, but the rate of displacement of its actuator elements depends on the amplitude of the control signal.

If the pilot, having switched on one of the modes, manually overrides, the SAU, depending on its design, will cut out (for that time during which the pilot manually flies the aircraft) or deflects only the fast-servo controls to pull out of a descending maneuver.

Calculation of altitude loss during recovery in Return To Level Flight mode indicated that in this instance, if the pilot had made use of the SAU 2-3 seconds prior to initial OUA actuation, the aircraft would have recovered from the descending maneuver at an altitude somewhat above Hsafe, by establishing zero bank. Average normal load factor thereby would have been less than that recorded by the SARPP-12.

Subsequently the regimental commander directed the pilots' attention to the peculiarities of aircraft stability and controllability characteristics during pullout from a descending maneuver. He reminded them that effectiveness of lateral control, that is, the ailerons on this aircraft, decreases with an increase in angles of attack. One of the indicators of their effectiveness is maximum angular rate of bank at full deflection. Figure 5 shows a typical relation omega-x pos=f(alpha). During flight at high angles of attack, stalling occurs at the tips of swept wings. It encompasses the zone of aileron position. Therefore during aileron deflection at high angles of attack lift on each wing changes negligibly, while drag increases quite considerably. Drag increases on a wing with downward-deflected aileron and decreases with an upward-deflected aileron. A yawing moment arises, which turns the aircraft in a direction opposite to the moment generated by the ailerons. At high angles of attack the bank created by aileron deflection causes sideslip to the lowered wing. In a laterally stable aircraft this causes a rolling moment directed opposite to that generated by the ailerons. As a result aileron effectiveness decreases at high angles of attack, and increases during aircraft recovery from a bank. Therefore it is for good reason that it is recommended that an aircraft first be recovered from a bank (when angles of attack are small), and only then should g forces be applied. An automatic control system operates according to this principle in recovery modes from descending maneuvers.

Thus in order to increase safety during the performance of descending maneuvers it is necessary thoroughly to analyze the information provided by onboard recording devices. It is essential comprehensively to examine

recorded flight parameters, the peculiarities of aircraft stability and controllability characteristics, the pilot's actions, and to assess the effectiveness of the various automatic devices he employs.

3024
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WELL-PLANNED AIR INTERCEPT TACTICS STRESSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 34-35

[Article, published under the heading "Tactical Training," by Lt Col V. Grishukevich: "Not Counting on Chance"]

[Text] The air environment at the tactical air exercise was complicated. Several "aggressor" aircraft, screened by heavy jamming, were attempting to penetrate through to a defended target from various directions and at various altitudes.

The command post ordered fighters to scramble. The 2-aircraft flight led by Military Pilot 1st Class Maj V. Kalugin turned to the prescribed heading. The combat pilots' mission was to prevent the "aggressor" from carrying out his intentions. The pilots flew with confidence, quickly responding to ground commands. Everything was going well.

But suddenly one of the "aggressor" aircraft, employing an unexpected maneuver, headed toward the target at maximum speed. Vectoring the fighters according to the conventional routine no longer ensured effective engagement. The "aggressor" might be able to sidestep the attack. Instantly assessing the new situation, the command post officer ordered Major Kalugin to employ a different variation. A great deal now depended on the flight leader's skill. And Kalugin performed flawlessly. The "aggressor" failed to get through.

The pilot's success was not based simply on luck. It was the result of a correct situation assessment, knowledgeable employment of an appropriate tactic, and precise execution of the command post's plan. Maj V. Kalugin had received practical confirmation time and again that his fighter gave him the capability to attack a target at maximum performance conditions at a high angle of approach, and he was prepared to do this if necessary.

We could cite many similar incidents. Lt Col V. Shabalin, Majs N. Polishchuk and G. Grebnev, and Capts F. Zariyev, Ye. Solov'yev, S. Krylov, Ye. Nikolayev, and V. Savich always perform tactically knowledgeably and innovatively in the air. They carry out their assigned missions with maximum effectiveness and fully utilize the capabilities of their aircraft and weapons.

Tactical sharpness, intelligent initiative and determination, however, do not come automatically. These qualities are developed during training sorties and tactical air exercises, when a tactical environment approximating actual combat is created. Unfortunately this point is sometimes forgotten. Therefore various unnecessary situation simplifications and relaxation of demands occur. Here is a typical example.

Routine flight operations were in progress in the squadron in which Military Pilot 2nd Class Capt N. Klimov serves. Having successfully accomplished an intercept, pilots were returning to the field. After landing, as always, the combat pilots discussed the mission results. Some were pleased at their success, others talked about the easy victory over the "aggressor," while still others expressed dissatisfaction with the performance of the tactical control officer. But all the aviators were unanimous about one thing: control and the air engagement followed an overly simplified scheme. Neither the "aggressor" nor the intercepting fighters employed any complex tactical devices. There was no tense contest, swiftness, stealth, or element of surprise. The intercept had been predictably routine, and the "aggressor" had followed a well-known, intimately-familiar route. Just how really effective could such training sorties be? Unnecessarily simplified conditions, when everything is known in advance, when there is no complex tactical environment involved, can provide pilots little benefit. In addition, combat pilots get the false impression that victory comes easy, and they become complacent. Naturally initiative and combat ingenuity are out of the question.

Of course such "organization" of combat sorties is a rare phenomenon in aviation subunits. But how can one explain the fact that certain commanders have such an approach to things?

"There was not enough time for more detailed preparation," was one explanation for such a miscue, for example.

And in actual fact? It turns out that there was more than enough time. It is simply that during preparations for flight operations in the squadron and in analyzing the forthcoming training sorties they failed to consider the tactical environment, and nobody gave any thought to devising new air combat tactics. Their position was as follows: why should we, since everything is artificial on training sorties? But if actual combat comes, we shall calculate everything out as prescribed. As practical experience shows, such an approach leads to a situation where at tactical air exercises, when a nonstandard, complex environment is created, pilots perform missions with greater intensity, with greater physical and psychological stress.

In today's highly-dynamic air combat a pilot who does not have sure mastery of his aircraft and its weapons, who lacks good theoretical training and developed tactical thinking, can hardly count on victory. Today one should not take to the air without a well thought-out plan of engagement and several rehearsed engagement variations. There is no doubt whatsoever that the adversary will introduce adjustments to this plan and will perform in his characteristic manner, in conformity with the capabilities of his equipment and his proficiency. And it is bad if he imposes his own will. A pilot's tactical proficiency consists in quickly and accurately assessing the

situation, selecting an optimal maneuver appropriate to the situation, seizing the initiative, and delivering an accurate attack.

In air combat one can defeat a powerful and calculating adversary only by surpassing him in flying technique, tactical and weapons skill. But this requires constantly improving one's knowledge and abilities. In the squadron commanded by Military Pilot 1st Class officer A. Karchevskiy, holder of the Order For Service To the Homeland and the USSR Armed Forces, III class, much attention is devoted to developing in the pilots tactical thinking, initiative, and the ability to employ new air combat moves. During the period of preparation for flight operations, maneuvers are practiced against a complex background environment. Pilots respond to various scenario instructions. This disciplines combat pilots and demands of them diversified knowledge and the ability not merely to carry out mechanically a missile-evasion maneuver, for example, in penetrating a strong antiaircraft defense, but demands that they find the most effective action variant for the given situation. All departures from realism are eliminated. Both sides prepare for combat to an equal degree: both the "aggressor" and whoever will oppose him. Thus is created a situation which is possible in actual combat.

When working on the cockpit simulator, Lt Col A. Karchevskiy has his men independently select a decision variant. As a result they develop tactical thinking and the ability to find the correct solution to the current situation. Of course knowledge of guideline documents and the combat capabilities of one's own equipment and that of the potential adversary is essential.

A special role is assigned to brief tactical drills. They vary in form and content. For example, a specific drill is conducted just before commencing to work on mastering a new type of combat application involving live gunnery or missile firing. The squadron commander announces the topic of the exercise in the tactics classroom. He then specifies the tactical environment: the "aggressor" aircraft force composition, topography, weather conditions, time of day, and other scenario instructions. After the pilots think through their decision, an exchange of views commences.

Experienced combat pilot Capt M. Nasvit, commander of a vanguard flight, takes the floor. His decision is distinguished by uniqueness and originality.

"What kind of comments does Captain Lavrichenko have?" the squadron commander asked.

"The topography is such that one can reach this point without worrying about being detected by the 'adversary'," the pilot replied. "Beyond this point the aircraft must disperse, and then link up again in the engagement area for a combined attack."

The officer sketched on the blackboard the proposed plan variation. Not all the pilots agreed with him, however. Each endeavored to state his own opinion. The pilots' suggestions were subjected to careful analysis. In this

manner they proceeded to look for the most effective variations of the forthcoming combat actions.

Tactics is a creative business. It is impossible, however, to find the correct way to achieve victory over a strong adversary without thorough knowledge of the laws governing today's air combat. It is for good reason that tactics are called a pilot's second weapon. He who possesses a consummate mastery of this weapon always has a combat advantage, possessing the capability to impose his will on the adversary and to achieve victory.

3024
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BOMBER NARROWLY AVOIDS WHEELS-UP LANDING

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 36-37

[Article, published under the heading "Constant Attention to Flight Safety," by Maj A. Podolyan: "Grounded. Why?"]

[Text] The flight operations shift was drawing to an end. The approach end searchlights went out, and the just-landed bomber taxied off the runway. The next aircraft was on final. Pilots and navigators, gathered by the tower waiting for the bus, were observing it. They were all in a good mood -- the flight operations schedule was completed and the members of three aircrews, who had returned from leave, had refreshed their flying skills. Maj G. Vodorezov, the squadron deputy commander, was about to land, and then they could head for their quarters.

The sound of the engines of the approaching aircraft grew louder. There was nothing to indicate impending trouble. Suddenly....

"His gear is up!" someone shouted in alarm.

They could now clearly see that the lights on the bomber which was about to land were definitely not in a gear-down landing light configuration. That very second the public-address speaker responded to the belated warning by the visual observer.

"Go around! 436, go around!" the flight operations officer ordered.

"Roger, executing missed approach," the pilot replied.

The bomber with its retracted landing gear entered the beam of the second searchlight. Additional airspeed was needed in order to accomplish a missed-approach climbout. Picking up airspeed, Vodorezov continued his descent, bringing the aircraft closer and closer to the concrete runway. Sparks showered under the fuselage. The people on the ground stood in mute silence.

Fortunately the incident ended happily. The engines, throttles advanced to full power, carried the aircraft up into the night sky. On the second attempt Maj G. Vodorezov made a safe landing.

This incident occurred quite some time ago, but it came to mind in connection with a certain conversation. Capt A. Stukalin was complaining to his colleagues that the commanding officer had grounded him because he had been late in putting his gear down prior to landing. Young aviators were present. Some of them kept silent, while others shared Stukalin's opinion: the decision to ground him was allegedly unfair. What is so bad, they argued, about the pilot lowering his gear after turning final? Should an experienced combat pilot be so severely punished because of this?

Of course in the given instance other measures could have been taken, but the squadron commander chose that which was the severest for the pilot -- grounding. And he unquestionably was right. A serious violation does not simply come out of nowhere. Its roots lie in disregard for established rules and regulations governing flight operations. Experience teaches us that if "trifling" deviations are not promptly correctly and carelessness is left unpunished, they gradually become habit, becoming for the violator a unique standard of conduct, and in the final analysis lead to serious consequences. In fact will a pilot who is not accustomed to analyze his actions in a critical manner be able to avert in time the development of an undesirable situation if his past deviations from the regulations have not led to anything dangerous? Before answering this question, let us analyze the landing approach made by squadron deputy commander Maj G. Vodorezov.

That night the crew was to make two flights out to the range. Vodorezov had performed such missions repeatedly in the past and did not consider them particularly difficult. During immediate preparations and practice drilling for the training sorties the squadron deputy commander solved various "terrestrial" problems. Having written down the departure time on his board and detailing the mock combat mission, the officer considered himself quite well prepared for the training sorties. During the final readiness check the squadron commander, asking if the crew was ready to go, was satisfied with Vodorezov's affirmative nod and signed the book.

The first sortie was flown without adverse comment. The bomber reached the target on schedule, and the crew hit it with an accurate strike. The second, however....

It was just a few minutes to takeoff. The navigator, Sr Lt V. Fedosov, glancing at his watch, paced back and forth by the aircraft; the aircraft commander had not yet appeared. Finally a bus drove up, and Vodorezov jumped out.

"I was refining the schedules. The inspector from the combined unit ordered me to," he explained his late arrival. "Let's go...."

Failing to take his crew chief's report and failing to inspect the aircraft, the pilot immediately proceeded to start the engines. There was no time to check the navigation systems, and therefore, limiting himself to a superficial check of the equipment, he requested taxi clearance.

They lifted off 2 minutes behind schedule. Seeking to make up the time, Vodorezov failed to follow the prescribed procedure for departing the area and began his turn 40 seconds earlier than the prescribed point. Senior Lieutenant Fedosov promptly noted the error and told the pilot, but the latter said nothing. The navigator said nothing more about this deviation from the flight plan. In the time they had been flying together he had become accustomed to such actions by Vodorezov. While demanding of his men unswerving observance of the established flight rules and regulations, the squadron deputy commander himself frequently took liberties in the air. It is true that to date they had not caused any gross errors. And this reassured Fedosov. In addition, he reasoned that the aircraft commander was a first-class pilot and knew what he was doing.

But this time their aircraft's early turn from the departure heading was noted. Shortly a command came over the air from the ground: "436, turn to and maintain heading..., 1 minute."

The pilot was forced to bank the bomber back in the other direction. The late departure meant that the crew might not reach the target on schedule, and the pilot added throttle. Time over the en-route waypoints were behind schedule, but the bomber reached the maneuver initiation point precisely on time. And over the target the crew performed with smoothness and precision. The targets were hit on the first pass. Executing an antiaircraft-fire evasion maneuver, Major Vodorezov headed for home.

There was little traffic in the air. From time to time brief air-to-tower communications from bombers on landing approach came over the radio.

"Turn onto final, skipper," the navigator's voice came over the intercom.

"Roger. Good boy! Good job," Vodorezov praised him.

The aircraft commenced its descent. At this moment the tower instructed: "436, gear and flaps up, maintain your altitude, execute a 360."

There was nothing unusual about this. Another aircraft returning from a long mission had less fuel remaining than they did, and the flight operations officer had decided to bring him in out of sequence. Evaluating the situation, Vodorezov put the aircraft into a left turn. He left the gear down and flaps extended.

"Landing gear, skipper," the navigator reminded him.

"We have plenty of fuel," the major replied. Thinking the matter over, however, after about 10 seconds he proceeded to retract his landing gear. He did not touch the flaps button.

When the DG showed a heading reciprocal to the final approach heading, they could see the navigation lights of the bomber descending on final approach gliding past on their left.

"Keep an eye on him," Vodorezov ordered the navigator, continuing the turn.

They were coming up on the final approach heading. The aircraft smoothly brought its wings back to level. The major's gaze glanced across the flap control panel: the extend flaps button was pressed. He eased off on the throttles and proceeded to descend. The pilot performed the procedures on final approach well honed over years of flying, automatically, in a precise sequence, but having seen that the flaps were extended, he forgot about the retracted landing gear. The navigator also failed to notice.

In the meantime the bomber which had landed ahead of them had cleared the runway.

"Engineer command post..., engineer command post..., engineer command post...," the flight operations officer called several times, but received no response. He then ordered: "Observer, inform the engineer that this aircraft is not to be fueled. It is going to the technical maintenance unit for routine inspection and maintenance."

Leaving his station, the soldier headed down to the telephone. While he was calling, Vodorezov's bomber crossed the outer marker. Returning, the observer reported to the flight operations officer that he had carried out his orders and put the binoculars to his eyes. He was stunned by what he saw: the bomber was approaching the searchlight beams with its gear still up. At this point his belated warning rang out over the public-address system.

The following detail was also elucidated in the course of analyzing this incident. Under the circumstances a warning signal should have sounded in the earphones of the crew members upon passing the outer marker, but no such warning sounded. It was determined that in checking the navigation system prior to departure, the electronic equipment specialist failed to reset one of the circuit breakers. This is why the warning signal failed to sound.

As we see, aviation personnel departures from performance of their job duties, individually insignificant but highly dangerous as an aggregate, came very close to resulting in serious consequences. Each individual erred "a little," and as a result an untypical but classic example of negligence took form, glaring irresponsibility by personnel in the performance of their military duty. Of course the pilot was the primary culprit, but a no lesser share of the blame goes to the other aviation personnel as well. Their mistakes are links of a single chain. If anybody had eliminated any one of these links in a timely manner, development of the accident-threatening situation would have stopped at a certain stage.

Indeed, if the pilot had conscientiously checked the cockpit equipment and extended his landing gear at the proper time, and if the flight operations officer had kept close tabs on the aircraft on final and had not diverted the observer with other tasks, the flight would have ended happily. I believe, however, that the source of the incident should be looked for much earlier, when Vodorezov first went unpunished for failing to follow a flight plan, when the electronics specialist first failed properly to follow aircraft equipment servicing procedures, and when nobody paid attention to the fact that the flight operations officer was diverting members of the ATC team from

performing their primary job duties. Over a certain period of time these aviation personnel developed the belief that they were infallible. Each one, knowing full well how one must proceed in a given instance, ignored established rules and regulations. Neither commanders nor the party organization, however, properly assessed this situation in a prompt and timely manner or corrected these errors, permitting them to develop into a persisting system of conscious violations.

Subsequently, of course, the entire incident was analyzed in the subunit, the proper conclusions were drawn, and the guilty parties received deserved punishment. But also of importance is the fact that gaps in the training and indoctrination process and in individual work with personnel were revealed, and specific measures were specified in order to prevent such an incident from happening in the future. This incident compelled each and every member of the outfit to reexamine his attitude toward performance of his job-related duties.

Returning to the beginning of our discussion of the severe measures taken by the squadron commander against Capt A. Stukalin, we can state that the late lowering of the landing gear was not caused by urgent necessity. The pilot had displayed negligence and had disregarded the established procedure. In addition, however, the captain had deliberately concealed the violation of procedures, and it was discovered only upon analysis of the flight recorder tapes. In spite of the fact that Stukalin had never done this before, the commanding officer grounded him, eliminating in a timely manner a link in the chain of potential violations and halting the pilot as he proceeded along a path of complacency and dishonesty.

Our aviators perform their difficult job day and night, in all weather. The process of developing highly-trained combat aviators who are totally dedicated to the cause of the party and people is constantly in progress. Training methods are being improved as aircraft equipment continues to evolve and develop further, and acquired theoretical knowledge is applied in practice in conditions maximally approaching actual combat. Today's pilot, navigator, engineer, and technician is first and foremost a highly-educated individual with broad knowledgeability and a high degree of moral-political training, a specialist who is capable of knowledgeably evaluating a developing situation, of quickly making correct decisions and predicting the subsequent development of events. Analyzing revealed deficiencies and violations of procedures, such an officer clearly sees the causes of deviations from proper procedures and prescribes the right way to correct them in a prompt and effective manner.

3024
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HISTORY OF COSMONAUT TRAINING CENTER OUTLINED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 40-41

[Article, published under the heading "Star City Then and Now," by AVIATSIYA I KOSMONAVTIKA correspondents, in interview format: "Birth of the Cosmonaut Training Center"; second part of a three-part article]

[Text] (I. Tyabin): I went to work at the Cosmonaut Training Center at the beginning of 1961. Yuriy Gagarin's space flight was drawing near. Few of us at the time gave thought to the fact that we were taking part in preparing for an event which would shake the world. We worked painstakingly at what seemed to us to be mundane tasks, training and drilling a specialized group on specialized devices, called stendy [test beds, test benches, test sleds, stands]. Our job was to acquaint the fellows with conditions of flight in space.

Today there are a great many such simulators, and they are fairly diversified. Each one, reproducing specific parameters, makes it possible to save time and money in the development of spacecraft instrumentation and equipment and to acquaint cosmonauts in detail with the conditions of future missions. But even today there is no device with which one can totally and immediately simulate all the conditions of space. But 25 years ago devices developed for training pilots were used at the Cosmonaut Training Center to train cosmonauts: treadmill, "ontokinetic drum", centrifuge, and shaking platform. Just the methods of working with them were improved.

The first specialized cosmonaut simulator (it was called the TDK-1) was the perfected Vostok spacecraft simulator, which was set up at one of the testing organizations. Yu. Gagarin and G. Titov trained on it. In mid-1961 a like simulator was installed at our center. It was designated the TDK-2. TsPK [CTC -- Cosmonaut Training Center] engineers and technicians Yu. Polukhin, I. Soldatov, and M. Zhukovskiy took part in its development together with people from industry. The simulator comprised a full-scale descent module with a device for simulating the moving Earth and starry sky, with an instructor's console and electrophysiological gear. Working instruments and systems were installed in the capsule (instrument panel, pilot's console, control stick, air conditioning system, radio gear, TV cameras, etc), which were configured exactly as in the actual Vostok capsule. An electronic computer and

electromechanical environment simulator made it possible to simulate all phases of a mission: launch into orbit, orbital flight, and descent to landing.

Practicing on the training simulator, the cosmonauts mastered skills in manual orientation, radio communications, operation of life support systems, conduct of scientific experiments, and keeping a mission log. In addition, they were taught to respond to unexpected, emergency situations (when various systems malfunctioned, failure of radio communications, depressurization, change in the chemical composition of the air and in air temperature, manual-sequence descent from orbit).

A comprehensive practice drill was the final stage of training. A mission would be simulation-flown on a real-time basis, with all life-support systems operating, that is, an environment was created which maximally approached an actual mission. How did the practice sessions go?

First the cosmonauts became acquainted with the capsule interior and the location of the instruments and equipment. They studied normal instrument readings, possible deviations in instrument readings, and learned what was taking place in a given system during on- and off-switching on tumbler switches and other controls. Subsequently procedures on launch into orbit, during orbital flight and descent from orbit would be rehearsed in a practical manner.

Each practice session would be held in the following sequence. The overall task assignment would be stated, after which the task would be refined and detailed and the flight log prepared. The cosmonaut would then don his pressure suit. Having completed preparations for the exercise, he would report ready and enter the capsule. After taking his place in the capsule, he would establish radio communications and check his equipment. After completing his cockpit checklist, he would report results of the check, how he was feeling, and that he was ready for launch. In addition to routine reports, the form of which was standard, the cosmonauts would also maintain a running account during the "mission," recording on tape.

We also simulated booster launch; the burning of the stages was accompanied by the noise of the rocket engines, reproduced with the aid of tape recorders and powerful speakers. After "lifting into orbit and separating from the final stage," the cosmonauts would respond to instructions and follow the scripted flight plan. This mission plan would gradually be made more complex. First they flew a single-orbit "mission," and subsequently we added practice drills which provided for rehearsing response actions to an emergency situation and bringing the capsule back manually. Upon completing a given drill, the cosmonaut would report any errors he had noted. Comments would then be made by the instructor and team leader.

Simulators would frequently be improved and perfected as training proceeded. This was also the case with the TDK-2, on which approximately 150 training sessions were conducted, with more than 1,000 hours logged. The cosmonauts and instructors, for example, did not like the simulation of the "running of the Earth." Senior instructor Ye. Tselikin asked me to think about how to

improve the image on the film. After some experimentation I selected what seemed to be that image which was closest to the real thing. We invited Yu. Gagarin to rate my product. He ran the image a bit and, with a pleased grin on his face, said: "Yes, it looks just like from space."

This assessment gave me a great deal of moral satisfaction and inspired me to further innovative quest.

The new TDK-3KV simulator appeared in May 1964, and the TDK-3KD at the end of that year. These were simulators for the Voskhod and Voskhod 2 spacecraft. Yu. Klement'yev, V. Belyakov, and others worked them. I am gratified to have the opportunity today to reminisce on how astronautics simulator engineering began precisely with these devices, that the first ideas were worked out on them, and in the final analysis they determined in large measure our victories in space.

(M. Lavrov): No modern simulator can substitute for going up in an actual aircraft. This has become particularly obvious today in connection with improvement of hardware. Indeed, no matter how complicated a simulator's operation, a pilot experiences no sense of fear when making a decision, even if he has poor knowledge of the equipment. The most he is risking is a lower grade on the simulator session. Actual flight is another thing altogether. Incorrect actions result in irreparable consequences. On a simulator it is impossible to reproduce such a risk! In addition, an actual flight develops in a pilot not only the ability continuously to analyze a changing situation, to make correct decisions and to execute them swiftly, but also increases his sense of responsibility for carrying out the mission, for the lives of his fellow crew members, and for the safety of the costly equipment.

Man's first flights in space showed that these qualities are also essential to a spacecraft mission commander. This is why a decision was made in 1963 to conduct regular cosmonaut flight training.

I became convinced through experience that man is tested in difficulties. A pilot for whom all flights run smoothly is still a question mark to his commanding officer. How will he respond in an unforeseen situation, in an emergency? Since not everybody is prepared to give an unequivocal reply to this question, I should like to stress one other important factor of flight training. It not only helps the cosmonaut develop those skills and qualities he needs, but also helps reveal his specific features and negative character and personality traits. It provides an overall evaluation of an individual and his promise as a crew member and mission commander.

...It was a normal flying day. The weather was at minimums, but was holding steady. The pilot-cosmonauts were practicing flying in IFR conditions. Maj A. Berezovoy, having completed his training flight, was returning to the airfield. It started to snow, although snow had not been in the forecast. The pilot could be diverted to the alternate field, but the weather was no better there. What was to be done? Thoroughly assessing the situation, and considering the fact that there had not been any long interruptions in logging flight hours by Maj A. Berezovoy, including in instrument conditions, as well as his personal qualities, such as a high degree of composure, tenacity, and

good reaction speed, we cleared him to land at his home field with absolute weather minimums. And Berezovoy was up to the task. He shot his approach with great precision and made a fine landing.

Flight training is an important stage in the process of qualitative selection of cosmonaut candidates and an important comprehensive test of the personal qualities of the future cosmonaut.

(A. Leonov): Time marches on inexorably. Following on the heels of Yu. Gagarin, G. Titov, A. Nikolayev, P. Popovich, V. Bykovskiy, and V. Tereshkova, the first multimember crew went into space, consisting of V. Komarov, K. Feoktistov, and B. Yegorov. At that time work on the Voskhod 2 spacecraft was already in full swing at the S. Korolev Design Office. It was to provide for accomplishing a new and unusual task: the problem of man walking in space emerged from the realm of fantasy to the mission agenda. It faced scientists, design engineers, physicians, and us cosmonauts with a great many questions. The answers to most of them could not be found in any book.

The Voskhod 2 spacecraft consisted of a pressurized command module, a service module, and an airlock. It had a standby solid-propellant retrorocket. Airlock operations were to be controlled by the mission commander from a console in the command module. Control could also be handled by the second pilot from a panel in the airlock. The spacecraft commander donned a special pressure suit so that if necessary he could come to the aid of the cosmonaut engaged in the EVA.

The medical people at Zvezdnyy [Cosmonaut Training Center] also sought answers to many questions. How should a person be prepared to walk in space? Would he overcome his fear of losing contact with the spacecraft and fear of "falling"? Would the sight of bottomless space not paralyze a person's mind and will? Even the following question arose: how should a person exit the craft into space: feetfirst or headfirst? The problem of personality compatibility between crew members also emerged at that time. D. Gorbov was one of the pioneers of a new branch of space medicine -- psychological training. He devised a number of methods and tests which help find optimal variations of character and personality capable of psychological unity in normal and emergency situations. This came somewhat later, it is true, but at that time personalities accommodated to compatibility in the process of daily work, study, and training.

Our training consisted of two stages. The first was a general physical stage, which included diving, parachute jumping, acrobatics, tumbling on the mat, and the 360 degree swing.... In short, all sports connected with stress on the organs of balance and equilibrium, the vestibular mechanism, and with the absence of a supporting base. This was a good course of training. All cosmonauts went through it. The second stage was a specialized one, containing numerous flying and ground tests to work on individual elements of the exit into space and the entire operation as a whole. We would go through mission rehearsals. This is difficult work, but it proved itself fully in space. First of all it produced confidence in the experiment. Secondly, it taught precision and consistency. I did almost everything in space just as I

had during the practice sessions, without departing from the established sequence. This was the most important thing.

Pavel Ivanovich Belyayev and I began training for the Voskhod 2 mission in 1962. But I did not begin to have a realistic hope of becoming a crew member until the end of 1963, when a group of cosmonauts and I went to the design office to become acquainted with the new craft. Sergey Pavlovich Korolev related to us in detail the general plan of and tasks involved in the mission, and when he finished, he peered intently at us and asked me to put on a pressure suit and demonstrate a "space walk." I became flustered, but Sergey Pavlovich affirmed: "Yes, Orelik, I mean you...."

It took me two hours to demonstrate this operation. I reported to the Chief Designer with some agitation: "The experiment can be carried out, but everything has to be thought through thoroughly...."

"Then get to work," Sergey Pavlovich said to me in parting, and added in a serious tone: "But one stipulation: think through everything from the very beginning, and if on completion of training something turns out not quite right, you have only yourself to blame."

This was a good sign. All of us knew full well that Korolev's word was of decisive importance in determining the crew, and naturally we endeavored to live up to his trust.

Over the course of the three years preceding the mission, my work with P. Belyayev was based on total confidence and respect. Everything I knew and was able to do, Pavel Ivanovich also knew and was able to do, and vice versa. We meticulously studied every element of the mission program, worked on assimilating and honing it here on the ground dozens and hundreds of times. We rehearsed response to emergency situations. And we tested the space walk proper in almost full-scale field conditions. It included working in the flying laboratory with brief periods of weightlessness, as well as practicing the EVA in the altitude chamber. The craft was placed in a large chamber simulating an altitude of 60 kilometers, that is, a high vacuum. Depressurization of pressure suit and spacecraft would mean instant death.

I shall never forget how Pavel Ivanovich helped me put on the backpack, how carefully he inspected me, opened and closed the spacecraft hatch, opened the airlock, and how I "exited" into lifeless space. He performed all procedures without haste, calmly and confidently. During practice sessions, just as subsequently in space, the mission commander observed my actions and gave me moral support. He would say to me: "Lesha, don't hurry, take it easy. Lesha, how are you feeling? Everything is going fine. Good boy! Attaway!" During our training for the mission we never forgot Korolev's demands: to work in close contact with his representatives and to resolve in the course of practice drills all problems which arose.

Whenever I had a little free time, I would read over K. E. Tsiolkovskiy's excellent story "Vne Zemli" [Beyond the Earth]. This book helped me find answers to many questions of what and how. (To be concluded)

3024
CSO: 9144/316

MATERIALS SCIENCE RESEARCH ON MANNED ORBITAL MISSIONS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 42-43

[Article, published under the heading "Space Program in the Socialist Countries," by M. Rimsha: "Materials Science in Orbit"]

[Text] In 1978 a new field opened up in research investigations conducted under the auspices of the Interkosmos Program -- study of the processes of the formation and behavior of materials in conditions of space. Today this problem is being handled in a separate section within the Space Physics working group. Adoption of this subject matter into the program of collaboration among the socialist countries was dictated by urgent requirements both of contemporary scientific affairs in general and space science and technology in particular.

Materials of various kinds with specialized, at times extraordinary properties and capabilities: semiconductors, crystals for infrared technology, highly complex optical materials -- are needed to accomplish many of the tasks facing mankind. Space offers man a near-ideal environment for obtaining such materials. An almost total absence of gravity on board a spacecraft and a high vacuum, which often hinder the cosmonauts and complicate the operation of some onboard instruments and systems, in the case at hand constitute a positive factor.

A number of questions arise, however. In particular, is there economic justification for transferring into space processes which have already been perfected on Earth? There are certain grounds for such doubts at the present stage. In the first place, it is much more costly to develop equipment to operate in space. Secondly, transporting this equipment into space and its operation on board a spacecraft or space station require considerable material expenditures. Thirdly, at the present stage what is essentially applied research cannot generate the commercial effect for the sake of which it is being conducted. At the present time such research is rather of an experimental design character. A long and difficult road must be traveled before we reach the point of building factories in space.

As we can see, objections are of a fairly substantial nature. One must also consider the fact, however, that a well-conceived and precisely-planned

program of research can shorten the purely investigative research period to a quite tolerable magnitude. Basic research in the field of space materials science, however, will never lose its pertinent significance and will always serve as a powerful key factor in the development of space industry.

At the present time it is very important, on the basis of existing space research experience in this area, to determine the principal immediate tasks to be accomplished within this area and the shortest ways to accomplish them. It is important thereby to avoid extremes and one-sided development of applied or basic research. Balanced development of these two branches of space materials science and their close interlinkage is perhaps the basic task facing scientists and specialists in this branch.

Here is another thought. As a rule space research is conducted in the main in the interests of our purely terrestrial needs. This also applies to space materials science. Science and technology are among the principal users of such materials. Instruments, systems and equipment used in space, for example, should possess maximum sensitivity and be able to operate in extreme conditions. It is no secret that the most sophisticated materials available to man are used in the manufacture of space hardware. Only with the aid of such materials is it possible successfully to accomplish the grandiose tasks facing space explorers. This is why the more intensively and productively space materials science develops, the more rapidly it will be able to provide space technology with new materials and the greater the return we shall obtain from all areas of space research. The importance and relevance of this problem are unquestioned.

The commencement of collaboration in this area within the framework of the Interkosmos Program coincided with preparations for the first manned missions by international crews. The opportunity was presented to conduct joint research on board the Salyut 6 orbital station, which for many years served as a base for the most diversified research. The Soviet Union provided scientists from the brother countries with Kristall and Splav spaceborne process equipment for the conduct of joint materials-science experiments, equipment which provides capability to conduct investigations with materials of various types, utilizing a broad range of methods of producing compounds. The value of the experiments was also enhanced by the presence on board the station of cosmonauts who had gone through specialized training for the conduct of research of this type.

Series of joint experiments encompassing a broad spectrum of problems pertaining to space materials science were conducted in the course of missions flown by nine international crews. A Soviet-Czechoslovak research program, for example, was devoted to problems of obtaining optical materials as well as crystals used in microelectronics. The Sirena experiment consisted in studying the process of producing cadmium-mercury-tellurium and cadmium-mercury-selenium type semiconductors, which are currently considered to be among the finest infrared radiation detectors.

Manufacture of optical glass with specialized properties, one of this country's traditional industries, became the basis for several experiments prepared by specialists in the GDR. Soviet-Bulgarian research devoted

considerable attention to problems of producing metal foam materials in conditions of weightlessness. Metal alloys and semiconductors became the subject matter of the Etves and Bealuca experiments conducted during a manned mission by Hungarian cosmonaut B. Farkas and his Soviet colleagues.

Scientists from the Socialist Republic of Vietnam, the youngest member of the Interkosmos Program, prepared the Halong series of experiments with specialists from the USSR and the GDR, involving investigation of multicomponent semiconductors and compounds of various types utilized in optoelectronics. In addition, the heating chamber of the Kristall unit was calibrated during the manned mission by Soviet and Vietnamese cosmonauts with the aid of Imitator equipment designed and built in the GDR.

Sugar, a typical Cuban product, was the object of research prepared by Cuban process engineers for A. Tomayo Mendez. These "exotic" experiments nevertheless were connected with accomplishing a number of modern technical tasks. Soviet and Mongolian specialists devoted their Altay and Erdenet experiments to problems pertaining to basic-research investigation of the occurrence of physical processes in conditions of microgravitation.

The scientific-technical problem of producing single crystals of a predetermined configuration, which is of importance in our time, was reflected in investigations, prepared by Romanian scientists, of the influence of capillary forces on the formation and quality of "space-produced" crystals. They completed the first phase of materials-science experiments in the Interkosmos Program.

We should note that the research projects enumerated above far from fully reflect that broad-subject spectrum of investigations in space materials science carried out on board the orbital complex during international manned missions.

The results of the first stage of joint research on these topics were summarized at an international symposium in Riga last year, attended by approximately 100 specialists from all countries involved in the Interkosmos Program. Such a broad representation once again emphasizes the great importance attached to this young area of space science by all the collaborating countries.

Not only the results of work conducted over the last 5 years, however, were the subject of discussion at this get-together. The basic directions of scientific quest in this area were also determined at the symposium, and joint projects were specified which are to be carried in coming years. Design and development of general-purpose process equipment is being completed in the CSSR, for example, with the aid of Soviet specialists, equipment meeting the state-of-the-art requirements placed on spaceborne instrumentation systems. The idea incorporated by specialists from the GDR in the Imitator instrument developed for the Soviet-Vietnamese mission has undergone further development. This instrument has now been transformed into a complex equipment system which, in addition to calibration of spaceborne "furnaces," will be able to perform a broad group of measurements of various parameters on board orbital stations. These new types of process equipment will become base units for

carrying out the international research program within the framework of the Interkosmos Program.

Thus the youngest component of the Interkosmos Program is proceeding along such a complex, event-rich path of development. It is the aim of materials scientists and their colleagues working in other scientific fields in the collaborative program to make space man's active ally in all domains of peaceful activity. Scientists are aware that advances in modern space science and technology should be directed toward the benefit of man, in the interes s of world peace.

The replies by CPSU Central Committee General Secretary Comrade K. U. Chernenko, chairman of the Presidium of the USSR Supreme Soviet, to questions put by the newspaper PRAVDA in September 1984 stressed the fact that it is vitally essential for our planet that the possibility of an arms race into space be prevented. The peaceful aspirations of the Soviet Union and the other nations of the socialist community in all domains of human activity are vividly reflected in the Interkosmos Program and in the humanitarian principles of peaceful exploration of space on which the program is grounded.

3024
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IMPORTANCE OF SATELLITE IMAGERY IN STUDY OF EARTH RESOURCES

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 44-45

[Article, published under the heading "The Space Program Serving Science and the Economy," by Candidate of Geological and Mineralogical Sciences V. Bryukhanov: "Keys to the Earth's Buried Resources"]

> [Text] The prosperity of peoples and entire countries today is determined in large measure by the availability of raw materials. Alongside traditional methods, geologists are using new methods of exploring for minerals, based on the latest advances in science and technology, in order to satisfy growing requirements in oil, gas, coal, metals, ground water resources, and mineral fertilizers. In particular, in recent years the Earth's crust has begun to be investigated at three levels: from space, from the air, and from the Earth's surface (with the aid of ultradeep boreholes).
>
> Utilization of satellite imagery has made it possible to prepare a specialized space-imaged geological map of the territory of the USSR, which provides extremely important material for planning the activities of geological organizations and establishments. This map was prepared under the direction of Candidate of Geological and Mineralogical Sciences V. Bryukhanov. At the editors' request he discusses spaceborne geological research methods and their importance for studying the geologic structure and metal-raw materials resources of the Soviet Union.

For decades geological maps were prepared on the basis of study of various rock outcrops. It is for good reason that the geologists' slogan "By Intellect and Hammer" was born at the 1st International Geological Congress. The quality and reliability of geological maps depended in large measure on the experience and knowledgeability of the specialists involved.

About 50 years ago geologists began using aerial photographs in their work, and the objectivity of mapping improving considerably. The advent of space

technology and satellite imagery brought capability to solve regional and, particularly, global geological problems.

Information obtained from space possesses a number of specific features which make it unique for interpreting many important features of the geologic structure of large areas and for understanding the Earth's overall geologic structure. These specific features include the following: small scale of observations, greater observational coverage, natural generalization of observable Earth surface forms, and increased depth of interpretation of geologic features.

A new area of geological investigation was born, which acquired the name "kosmogeologicheskiy." It helps in discovering and studying geologic features and structures which cannot be determined by other methods. And yet they are important components of the structure of the lithosphere and in many instances exert considerable influence on the patterns and mechanisms of distribution of minerals.

It was established on the basis of satellite imagery, for example, that so-called lineaments and ring structures occur on the Earth as well as on other planets of the Solar System. It is believed that lineaments, many of which can be traced for hundreds and thousands of kilometers, are of fracture origin and are rooted in the Earth's mantle. One cannot say that faults were unknown to geologists prior to this time. They had been discovered and mapped both by geological and geophysical methods. But utilization of satellite imagery made it possible to determine their presence in those areas where they had not previously been detected, and to tie them into specific systems.

It has been established that ring structures are of various origin. It is believed that they could have developed as a result of block movements of the basement rock, large plicative dislocations, intrusive or extrusive magma flows, and even processes of formation of the Earth's crust, which took place more than 4 billion years ago.

The information obtained from space is rather diversified. Multiple frequency-band scanning devices carried on board Meteor satellites make it possible to study geologic structures on a global and continental scale, while photographs taken by Kosmos series satellites and Salyut orbital space stations make it possible to study geologic structures at the regional and local levels and to perform the requisite detailing of the most complex-structure areas or areas which are promising as regards mineral prospecting.

We obtain additional information from visual observations of geologic features by cosmonauts. The crews consisting of pilot-cosmonauts V. Kovalenok and I. Ivanchenkov, L. Popov and V. Ryumin, for example, were very helpful in spotting and studying geologic structures in the southern part of the USSR. A verification check by geologists on the information conveyed by cosmonauts indicated that this information was highly reliable. Similar work was performed on the Salyut 7 station by pilot-cosmonauts L. Kizim, V. Solov'yev, and O. At'kov.

The success achieved by Soviet geologists in utilizing satellite remote Earth sensing data made it possible, beginning in the mid-1970's, to commence a systematic geological study of the territory of the USSR from space and to synthesize the obtained materials by the end of the decade.

The result of this was preparation and publication in 1980 of a "cosmogeological" map of linear and ring structures on the territory of the USSR, on a scale of 1:5,000,000. Images taken by Meteor satellites were used to prepare this map; interpretation of the imaging data made it possible to distinguish the largest geostructural elements. Further work in this area was completed with preparation and publication in 1984 of a "cosmogeological" map of the USSR, on a scale of 1:2,500,000, which was displayed at the 27th International Geological Congress, held in Moscow in August 1984. This map, which is entirely without counterpart, is substantially more detailed than the preceding version.

What distinguishes the "cosmogeological" map of the USSR from traditional geological maps, and what is its scientific and practical significance?

Structural features on traditional geological maps are shown as age-related assemblages of rocks, the cartographic generalization of which depends to a considerable degree on the notions of the maps' authors. In imagery taken from space we see the results of a natural generalization of areal geologic features, the nature of representation of which is determined by the combination of matter and the conditions of bedding of the rock involved. Identification and plotting on a "cosmogeological" map of these features, which are called "strukturno-veshchestvennyye kompleksy" [structural-material complexes], provide a fuller idea of their formation and dynamics and make it possible to give a more objective assessment of their mineragenetic significance, since two major ore-controlling factors are considered simultaneously: composition of the rocks and their structural peculiarities.

Satellite images, due to a natural generalization, frequently show not individual magma intrusions between layers of the Earth's crust (intrusive bodies), but rather the areas of their extent, which indicate the occurrence of unexposed intrusive rock close to the surface, between isolated outcrops. This is also very important in a mineragenetic respect, since deposits of many important minerals are associated with contact zones. Such areas are depicted on the map and can be viewed as potentially metalliferous.

The very first examination of satellite images indicated that the Earth's crust is fractured by a dense network of faults, and faults can be observed even in those cases where they do not appear at the surface. Analysis of satellite images of large flat regions (so-called platforms) made it possible for the first time to show deep basement block-boundary faults which predetermined the formation of the principal structural elements of the platform. The importance of such information is determined by the fact that such regions constitute the principal oil and gas provinces of the Soviet Union. These include the West Siberian Platform, the Caspian Depression, the Cisural Trough, etc.

A certain pattern is noted in the placement of the largest faults. One can clearly make out an orthogonal system consisting of north-south and east-west structures, as well as four diagonal systems. Of considerable interest are fault systems which cut across the entire Eurasian continent and extend into ocean basins. These include the Ural-Oman lineament, the Karsko-Dzhelamskaya and Chaunsko-Olyutorskaya zones. Such faults and the zones they form had not been depicted on geological maps. A preliminary analysis of the largest fault system indicated that they not only play an important role in the history of the Earth's development, but in a number of instances control the distribution of many minerals.

Ring structures, which are visible on satellite images in the form of isometric anomalies or concentric lines, constitute fundamentally new information which was never represented on geological maps. They are distributed on the territory of the USSR with approximately uniform density, but structures of different genetic types are localized in specific regions. The "cosmogeological" map of the USSR shows more than 4,000 ring structures, with the genetic characteristics determined for about 2,000 of these, while the remainder are designated as structures of undetermined or complex origin. Elucidation of the physical and geological essence of the ring structures, particularly those which are greater than 120-150 km in diameter, is an urgent task for geology. The fact is that these features are also frequently ore-controlling, especially at points where they intersect with faults.

The information obtained from orbital vehicles frequently does not fit within conventional notions of the geologic structure of a given region, which in many instances forces us to revise established views on its development, metallogeny or oil and gas prospects.

In the extreme northwestern part of the USSR, on the Kola Peninsula and in Karelia, within the boundaries of the Baltic Shield, a system of relatively monolithic blocks has been identified, consisting of gneisses and crystalline shales, as well as a network of narrow "coupling zones" separating them, formed by greenstone sequences which are dislocated to a varying degree. A preliminary map analysis indicated that precisely these zones are the most promising for prospecting for new deposits of ore minerals.

In the Transbaykal, within the boundaries of the Aldan shield, which contains ancient metamorphic rock sequences, ring structures 150-200 km and more in diameter have been discovered. Study of geophysical materials and establishment of the patterns and mechanisms of distribution of rocks of various composition and age enable us to state the hypothesis that these structures were formed during the early stages of the Earth's development, while the structures proper are akin in origin to similar forms developed on other planets of the Solar System, particularly on Mars, as well as on the Moon. The stage nature of these structures in the Earth's subsequent history determined the patterns of distribution of various types of ore minerals.

A large number of ring structures between 30 and 50 kilometers in diameter have been identified in the eastern part of the country, within the boundaries of development of ancient volcanic rock sequences; evidently these ring structures correspond to the centers of volcanic activity. They are broken up

by a network of faults, at the points of intersection of which with the concentric arcs favorable conditions are formed for localization of nonferrous metal deposits.

Geologists have determined the importance of the role of imbricated thrust faults, which in a number of instances are deep overthrusts separating the platform and fold structures (overthrusts of the Baykal and Verkhoyansk fold systems onto the Siberian Platform, the Urals folded structure onto the East European Platform, etc). Underthrust parts of the platform, frequently characterized by thick development of covering sedimentary beds, are potentially oil and gas-bearing, which is of considerable importance for expanding the base of these highly valuable energy raw materials.

Thus the information represented on the "cosmogeological" map not only represents another scheme of the structural-geological configuration of the territory of the USSR, but also constitutes problem material which states many important questions of a general geological and mineragenetic nature which should be thoroughly considered and resolved. Created on an objective factual basis, this map opens up a new direction of geological investigation, the results of which one is hard put to assess at the present time.

3024
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U.S. "STAR WARS" PROGRAM ATTACKED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 2, Feb 85 (signed to press 4 Jan 85) pp 46-47

[Article, published under the heading "The Pentagon's Orbital Arsenal," by Col M. Krymov: "Stellar Militarism"; based on materials in the foreign press]

[Text] The U.S. military-political leadership is continuing to escalate the arms race in space. Today this is arousing even greater alarm on the part of the peoples of the world, since now no longer merely plans but practical steps are being undertaken by U.S. circles in the direction of militarizing space.

As is evident from Western mass media reports, the U.S. Department of Defense has been given the go-ahead, within the framework of the recently-approved new "national strategy in the area of exploiting space," to plan future military operations in space with the utilization of manned space vehicles. Thus, alongside offensive space systems presently being developed and tested in the United States, such as antisatellite weapons and space-based antimissile systems, the "green light" is being given to a large-scale program to develop another generation of offensiev space weaponry, which essentially constitute a new kind of not intercontinental but global offensive weapons. We are taking about plans to develop so-called military transatmosphere manned space vehicles (TPKA), as well as multipurpose permanent manned orbital stations.

According to reports in the foreign press, one TPKA version is being developed as a combined air-space vehicle (VKS), capable of both orbital and suborbital controlled flight in the upper layers of the atmosphere at hypersonic speed (at Mach 20). Its purpose is no secret: to perform global missions "within the boundaries of the entire conflict zone," including reconnaissance, tactical control, delivery of strikes, space surveillance, and emergency delivery of automatic military satellites into space to replace failed satellites. It is particularly stressed that such vehicles "will be able to carry out operations... if necessary, also in the upper atmosphere above the territory of the potential adversary."

A number of major U.S. aerospace companies are working at an accelerated pace on development of several TPKA designs, with capability to be launched from a mother aircraft, horizontal takeoff from a runway, as well as the traditional vertical launch. McDonnell Douglas, for example, proposes a version of an

air-space vehicle which occupies a middle position in size and weight between the F-15 fighter and the DC 10 passenger aircraft. It would be heat-insulation coated and feature a combined propulsion unit. It is believed that in this version the VKS will be able to launch vertically (like the Space Shuttle transport), but all its launch equipment will be much simpler. The powerplant for this vehicle has already undergone static testing. Another American company, Boeing, is conducting studies of the possible use of a modernized Boeing 747 as a launch platform for a VKS.

The Air Force Aerospace Command is for its part showing particular interest in an air-space vehicle design providing a horizontal takeoff from the runway of any large airport. Such a vehicle, carrying a crew of two, would boost into polar orbit a payload of up to 9 tons, and its design would provide it capability for repeated descent from orbit to altitudes of 76-107 kilometers and subsequent return into orbit. In the terminal phase of a mission the craft's powerplant would operate in turbojet engine mode, enabling the craft to land on a runway. The Air Force is also considering horizontal launch of a TPKA employing a rail-type acceleration device featuring a rocket sled and air cushion.

Why has the Pentagon so eagerly seized upon the idea of an air-space vehicle? As the press indicates, it is fully in conformity with the traditional mindset of the leaders in Washington, and is grounded on that same obsession with the possibility of achieving military superiority over the Soviet Union. As regards military aspects, according to statements made by Air Force spokesmen, they are hoping that an air-space vehicle, in comparison with future conventional aircraft and "traditional" space vehicles, will provide greater "combat effectiveness at various stages of a conflict when performing strike delivery missions." It could not be stated more clearly or frankly!

VKS combat employment "scenarios" are already being devised. In the opinion of the journal INTERNATIONAL DEFENSE REVIEW, such an aircraft would be capable, flying in orbit, of performing target reconnaissance, executing maneuvers, and then returning to its initial orbit for another pass over the target. It is noted that in a 24-hour period an air-space vehicle could twice be launched into Earth orbit, and response time from the moment an alert is sounded would be only a few minutes.

Thus we have a vehicle capable of extensively maneuvering in space and in the atmosphere, with high speed, a global zone of operations and a high degree of readiness, capability to deliver strikes in combination with preliminary target reconnaissance.... Is the Pentagon not dreaming about creating a space-based reconnaissance-strike system? Whether or not this is the case, a manned air-space vehicle is already today considered as a key element of the U.S. Air Force military offensive space system of the near future. And in spite of the claim that the VKS is at an early stage of development, funds are being appropriated for this project, and the U.S. Air Force is planning demonstration tests of the VKS, utilizing the Space Shuttle or a B-52 bomber to launch it.

Parallel with this, the U.S. Defense Department is studying the concept of another military-designation TPKA -- a "Cruiser," which would be considerably

lighter, simpler, and cheaper. This craft, weighing approximately 4.5 tons, would be launched from the Space Shuttle orbital stage, a heavy transport aircraft, or would be boosted into orbit by an MX missile. In order to simplify onboard equipment, the craft's two-man crew will be accommodated in an unpressurized cabin in special pressure suits, which would also contain part of the flight equipment. Plans call for utilizing a parachute-wing (for primary deceleration), followed by a conventional parachute system, for returning the craft from low Earth orbit. A braking system would bring the craft down from high orbits. This vehicle would also have the capability to plunge into the atmosphere to perform aerodynamic maneuvers making it possible to change orbital altitude and inclination. In the opinion of the designers of the "Cruiser" craft, with adequate appropriations its maiden flight could take place as early as 1988.

Within the scope of the new space strategy ratified by the present Washington Administration, there are plans to build a permanent manned orbital station. In the opinion of the director of NASA, it will be a "cornerstone" of the Pentagon's "Star Wars" program, which calls for the employment of antisatellite weapons, an ABM system with elements of space basing, and other military space hardware. In spite of numerous assurances by U.S. officials about the station's allegedly peaceful purpose, U.S. military agencies have already become actively involved in formulating requirements on it, which ensure that it has the potential for military utilization. Defense Department spokesmen have announced that their agency "will give the program considerable assistance" and will use the station on the same basis as the Space Shuttle. We know what that basis is, for the Pentagon has virtually appropriated the Space Shuttle for its own militarist purposes in large measure due to generous financial injections into this program from military funding in the U.S. federal budget.

Numerous orbital station designs have been developed to date. They incorporate a modular construction with expansion capability by adding on new modular building blocks. The "core" would be built at the first stage (toward the beginning of the 1990's), with subsequent construction of a "developed" orbital station with greater power capability and a larger number and volume of additional functional modular units.

The journal AVIATION WEEK AND SPACE TECHNOLOGY presents one of the designs of an orbital station "nucleus" and its "developed" version (see figure) [not reproduced]. The station "nucleus" would be assembled in a circular orbit at an altitude of about 500 kilometers. It will consist of four standard modules -- crew quarters, two laboratory modules, and a storage module; a pressurized connector module; a truss beam structure to service self-contained satellite-platforms, and a power module, which will contain the power generating unit, life-support system equipment, and other service equipment. A transport system based on the Space Shuttle will carry station modular components, supplies and relief crews into orbit.

The orbital station may additionally include several self-contained satellite-platforms designed for the performance of technical operations outside the station, interorbital tugs to carry payloads into higher orbits, for returning them to the station, and for performing servicing and maintenance operations.

Among the probable modes of military utilization of a manned orbital station, the foreign press points first and foremost to the possibility of its employment as a platform for such weapons as lasers, nuclear devices, space-based missiles, kinetic-energy weapons, hypervelocity gun, etc. According to Pentagon requirements, station construction and crew should ensure its multipurpose use, in order to have the capability to carry out a broad range of combat operations in space and from space, including reconnaissance and surveillance, space communications and navigation, missile launch warning, and protection of self-contained satellites positioned near the station. The station would also be used as a command post capable of operating independent of ground facilities.

In analyzing the advantages of a manned orbital station in comparison with unmanned satellites, U.S. Air Force experts particularly note those advantages connected with man's presence on board the station: real-time decision making, response to unscheduled events, discovery of concealed or latent patterns, inspection of foreign space vehicles, replacement and calibration of onbaord instruments.

Hiding behind demagogic claims of an alleged growing Soviet threat in space and spreading a phony lie that the Soviet Union is the initiator in development of space weapons, the U.S. leaders, as has been the case repeatedly in the past, once again are the initiator in developing a new and dangerous kind of weapon -- manned offensive space weapon systems. A hypocritical attempt on the part of some Western mass media to present these sinister plans simply as another harmless "U.S. space spectacular aimed at demonstrating technical capabilities" is nothing other than a clever trick aimed at deceiving the world community, while U.S. imperialism is attempting to push through a new kind of offensive weapon, this time a space-based weapon. Therefore a demand proceeding first and foremost from the Soviet Union, as well as by other peace-loving forces throughout the world -- to put a halt to such a development of events while it is still not too late, to break the spiral of escalation of space arms, to pull back from that dangerous point beyond which this process may become uncontrollable and irreversible, is more crucial today than ever before.

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